

**KLE Dr. M.S.SHESHGIRI  
COLLEGE OF ENGINEERING & TECHNOLOGY  
UDYAMBAG, BELAGAVI – 590008.**

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**QUESTION PAPERS**

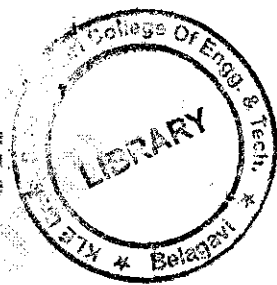
**3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> & 8<sup>th</sup> SEMESTER**

**CIVIL**

**DEC-2019 / JAN- 2020**

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18MAT31

**Third Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Transform Calculus, Fourier Series and Numerical**  
**Techniques**

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

**Module-1**

- 1 a. Find the Laplace transform of:
  - (i)  $\left(\frac{4t+5}{e^{2t}}\right)^2$
  - (ii)  $\left(\frac{\sin 2t}{\sqrt{t}}\right)^2$
  - (iii)  $t \cos at$ .

(10 Marks)
- b. The square wave function  $f(t)$  with period  $2a$  defined by  $f(t) = \begin{cases} 1 & 0 \leq t < a \\ -1 & a \leq t < 2a \end{cases}$ . Show that  $\left(\frac{1}{s}\right) \tanh\left(\frac{as}{2}\right)$ . (05 Marks)
- c. Employ Laplace transform to solve  $\frac{d^2y}{dt^2} - \frac{dy}{dt} = 0, y(0) = y_1(0) = 3$ . (05 Marks)

**OR**

- 2 a. Find (i)  $L^{-1}\left\{\frac{s^2-3s+4}{s^3}\right\}$  (ii)  $\cot^{-1}\left(\frac{s}{2}\right)$  (iii)  $L^{-1}\left\{\frac{s}{(s+2)(s+3)}\right\}$  (10 Marks)
- b. Find the inverse Laplace transform of  $\frac{1}{s(s^2+1)}$  using convolution theorem. (05 Marks)
- c. Express  $f(t) = \begin{cases} 2 & \text{if } 0 < t < 1 \\ \frac{t^2}{2} & \text{if } 1 < t < \frac{\pi}{2} \\ \cos t & t > \frac{\pi}{2} \end{cases}$  in terms of unit step function and hence find its Laplace transformation. (05 Marks)

**Module-2**

- 3 a. Obtain the Fourier series of  $f(x) = \begin{cases} 2 & -2 < x < 0 \\ x & 0 < x < 2 \end{cases}$  (08 Marks)
- b. Find the half range cosine series of,  $f(x) = (x+1)$  in the interval  $0 \leq x \leq 1$ . (06 Marks)
- c. Express  $f(x) = x^2$  as a Fourier series of period  $2\pi$  in the interval  $0 < x < 2\pi$ . (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 4 a. Compute the first two harmonics of the Fourier Series of  $f(x)$  given the following table :

$x^\circ$	0	60°	120°	180°	240°	300°
y	7.9	7.2	3.6	0.5	0.9	6.8

- b. Find the half range sine series of  $e^x$  in the interval  $0 \leq x \leq 1$ . (08 Marks)  
 (06 Marks)  
 c. Obtain the Fourier series of  $f(x) = \frac{\pi^2}{12} - \frac{x^2}{4}$  valid in the interval  $(-\pi, \pi)$  (06 Marks)

**Module-3**

- 5 a. Find the Infinite Fourier transform of  $e^{-|x|}$ . (07 Marks)  
 b. Find the Fourier cosine transform of  $f(x) = e^{-2x} + 4e^{-3x}$ . (06 Marks)  
 c. Solve  $u_{n+2} - 3u_{n+1} + 2u_n = 3^n$ , given  $u_0 = u_1 = 0$ . (07 Marks)

OR

- 6 a. If  $f(x) = \begin{cases} 1 & \text{for } |x| \leq a \\ 0 & \text{for } |x| > a \end{cases}$ , find the infinite transform of  $f(x)$  and hence evaluate  $\int_0^\infty \frac{\sin x}{x} dx$ . (07 Marks)  
 b. Obtain the Z-transform of  $\cosh n\theta$  and  $\sinh n\theta$ . (06 Marks)  
 c. Find the inverse Z-transform of  $\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$  (07 Marks)

**Module-4**

- 7 a. Solve  $\frac{dy}{dx} = e^x - y$ ,  $y(0) = 2$  using Taylor's Series method upto 4<sup>th</sup> degree terms and find the value of  $y(1.1)$ . (07 Marks)  
 b. Use Runge-Kutta method of fourth order to solve  $\frac{dy}{dx} + y = 2x$  at  $x = 1.1$  given  $y(1) = 3$  (Take  $h = 0.1$ ). (06 Marks)  
 c. Apply Milne's predictor-corrector formulae to compute  $y(0.4)$  given  $\frac{dy}{dx} = 2e^x y$ , with (07 Marks)

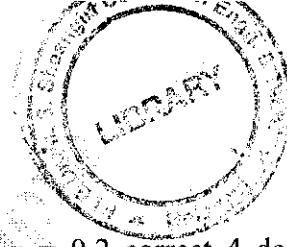
x	0	0.1	0.2	0.3
y	2.4	2.473	3.129	4.059

OR

- 8 a. Given  $\frac{dy}{dx} = x + \sin y$ ;  $y(0) = 1$ . Compute  $y(0.4)$  with  $h = 0.2$  using Euler's modified method. (07 Marks)  
 b. Apply Runge-Kutta fourth order method, to find  $y(0.1)$  with  $h = 0.1$  given  $\frac{dy}{dx} + y + xy^2 = 0$ ;  $y(0) = 1$ . (06 Marks)  
 c. Using Adams-Bashforth method, find  $y(4.4)$  given  $5x \left( \frac{dy}{dx} \right) + y^2 = 2$  with

x	4	4.1	4.2	4.3
y	1	1.0049	1.0097	1.0143

(07 Marks)



**Module-5**

- 9 a. Solve by Runge Kutta method  $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$  for  $x = 0.2$  correct 4 decimal places, using initial conditions  $y(0) = 1, y'(0) = 0, h = 0.2$ . (07 Marks)
- b. Derive Euler's equation in the standard form,  $\frac{\partial f}{\partial y} - \frac{d}{dx} \left[ \frac{\partial f}{\partial y'} \right] = 0$ . (06 Marks)
- c. Find the extremal of the functional,  $\int_{x_0}^{x_1} y^2 + (y')^2 + 2ye^x dx$ . (07 Marks)

**OR**

- 10 a. Apply Milne's predictor corrector method to compute  $\frac{d^2y}{dx^2} = 1 + \frac{dy}{dx}$  and the following table of initial values:

x	0	0.1	0.2	0.3
y	1	1.1103	1.2427	1.3990
y'	1	1.2103	1.4427	1.6990

- (07 Marks)
- b. Find the extremal for the functional,  $\int_0^{\frac{\pi}{2}} [y^2 - y'^2 - 2y \sin x] dx$ ;  $y(0) = 0; y\left(\frac{\pi}{2}\right) = 1$ . (06 Marks)
- c. Prove that geodesics of a plane surface are straight lines. (07 Marks)

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18MATDIP31

**Third Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Additional Mathematics – I**

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

**Module-1**

- Express the following complex number in the form of  $x + iy$ :  $\frac{(1+i)(1+3i)}{1+5i}$ . (06 Marks)
  - Prove that  $\left(\frac{\cos\theta + i\sin\theta}{\sin\theta + i\cos\theta}\right)^4 = \cos 8\theta + i\sin 8\theta$ . (07 Marks)
  - If  $\vec{a} = (3, -1, 4)$ ,  $\vec{b} = (1, 2, 3)$  and  $\vec{c} = (4, 2, -1)$ , find  $\vec{a} \times (\vec{b} \times \vec{c})$ . (07 Marks)

OR

- Find the angle between the vectors,  $\vec{a} = 5\hat{i} - \hat{j} + \hat{k}$  and  $\vec{b} = 2\hat{i} - 3\hat{j} + 6\hat{k}$ . (06 Marks)
  - Prove that  $\left[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}\right] = \left[\vec{a}, \vec{b}, \vec{c}\right]^2$  (07 Marks)
  - Find the fourth roots of  $-1 + i\sqrt{3}$  and represent them on the argand diagram. (07 Marks)

**Module-2**

- Obtain the Maclaurin's expansion of  $\log_e(1+x)$ . (06 Marks)
  - If  $u = \sin^{-1}\left[\frac{x^3 + y^3}{x+y}\right]$ , prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2 \tan u$ . (07 Marks)
  - If  $u = x(1-y)$ ,  $v = xy$ , find  $\frac{\partial(u,v)}{\partial(x,y)}$ . (07 Marks)

OR

- Obtain the Maclaurin's series expansion of the function  $\log_e \sec x$ . (06 Marks)
  - If  $u = x^2 - 2y$ ;  $v = x + y$  find  $\frac{\partial(u,v)}{\partial(x,y)}$ . (07 Marks)
  - If  $u = f(x-y, y-z, z-x)$ , prove that  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$ . (07 Marks)

**Module-3**

- Find the velocity and acceleration of a particle moves along the curve,  $\vec{r} = e^{-2t}\hat{i} + 2\cos 5t\hat{j} + 5\sin 2t\hat{k}$  at any time  $t$ . (06 Marks)
  - Find  $\text{div } \vec{F}$  and  $\text{curl } \vec{F}$ , where  $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$ . (07 Marks)
  - Show that  $\vec{F} = (2xy + z^2)\hat{i} + (x^2 + 2yz)\hat{j} + (y^2 + 2xz)\hat{k}$  is conservative force field and find the scalar potential. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Show that the vector field,  $\vec{F} = (3x + 3y + 4z)\hat{i} + (x - 2y + 3z)\hat{j} + (3x + 2y - z)\hat{k}$  is solenoidal. (06 Marks)
- b. Find the directional derivative of  $\phi = \frac{xz}{x^2 + y^2}$  at  $(1, -1, 1)$  in the direction of  $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$ . (07 Marks)
- c. Find the constant 'a' such that the vector field  $\vec{F} = 2xy^2z^2\hat{i} + 2x^2yz^2\hat{j} + ax^2y^2z\hat{k}$  is irrotational. (07 Marks)

**Module-4**

- 7 a. Find the reduction formula for  $\int_0^{\pi/4} \sin^n x dx$ . (06 Marks)
- b. Evaluate  $\int_0^1 \int_0^3 x^3 y^3 dx dy$ . (07 Marks)
- c. Evaluate  $\int_0^3 \int_0^2 \int_0^1 (x + y + z) dz dx dy$ . (07 Marks)

OR

- 8 a. Evaluate :  $\int_0^{\pi/6} \sin^4(3x) dx$ . (06 Marks)
- b. Evaluate :  $\int_0^1 \int_x^{1+x} xy dy dx$ . (07 Marks)
- c. Evaluate :  $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} xyz dz dy dx$ . (07 Marks)

**Module-5**

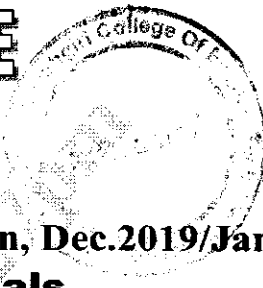
- 9 a. Solve :  $\frac{dy}{dx} + y \cot x = \sin x$ . (06 Marks)
- b. Solve :  $(2x^3 - xy^2 - 2y + 3)dx - (x^2y + 2x)dy = 0$ . (07 Marks)
- c. Solve :  $3x(x + y^2)dy + (x^3 - 3xy - 2y^3)dx = 0$ . (07 Marks)

OR

- 10 a. Solve :  $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$ . (06 Marks)
- b. Solve :  $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$ . (07 Marks)
- c. Solve :  $[1 + (x + y) \tan y] \frac{dy}{dx} + 1 = 0$ . (07 Marks)

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18CV32

**Third Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Strength of Materials**

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

**Module-1**

- 1 a. Define the four elastic constants. (06 Marks)
- b. Derive an expression for the displacement of a tapering circular bar subjected to an axial force. (08 Marks)
- c. The modulus of elasticity and shear modulus of a bar is 200Gpa and 80Gpa respectively. Compute the bulk modulus and reduction in diameter of a circular bar 36mm diameter and 3m long, when stretched by 3mm. (06 Marks)

**OR**

- 2 a. Write a note on temperature stress in simple bars. (05 Marks)
- b. Derive the relation between modulus of elasticity, modulus of rigidity and Poisson's ratio. (08 Marks)
- c. A composite tube consists of a steel tube 165mm internal diameter and 15mm thick enclosed by an aluminium tube 200mm internal diameter and 15mm thick. The composite tube carries an axial load of 1500kN. Compute the stresses in each material, load carried by each material and the compression of the composite tube, if its length is 300mm.  $E_s = 200\text{Gpa}$  and  $E_{AL} = 70\text{Gpa}$ . (07 Marks)

**Module-2**

- 3 a. Explain maximum shear stress theory of failure. (06 Marks)
- b. A closed cylindrical steel vessel 8m long and 2m internal diameter is subjected to an internal pressure of 5MPa with the thickness of the vessel being 36mm. Compute hoop stress, longitudinal stress, maximum shear stress, change in length, change in diameter and change in volume. Assume  $E = 200 \text{ kN/mm}^2$  and  $\mu = 0.3$ . (08 Marks)
- c. An element is subjected to a tensile stress of  $120\text{N/mm}^2$  on the vertical plane and another compressive stress of  $80\text{N/mm}^2$  on the horizontal plane. Compute the normal and tangential stresses on a plane making an angle of  $30^\circ$  anticlockwise with the vertical plane. (06 Marks)

**OR**

- 4 a. The stresses acting at a point in a two dimensional system is shown in Fig.Q4(a). Determine the principal stresses and planes, maximum shear stress and planes, normal and shear stresses on plane AB. (10 Marks)

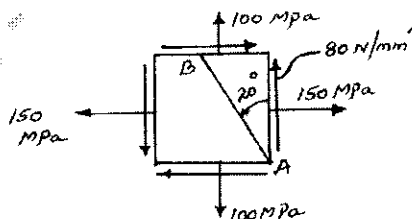


Fig.Q.4(a)

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- b. Differentiate between thin and thick cylinders. (03 Marks)
- c. Compute the thickness of the wall of a thick cylinder subjected to an internal pressure of  $40 \text{ N/mm}^2$ . The internal diameter of the cylinder is  $200 \text{ mm}$  and the permissible hoop stress is  $140 \text{ MPa}$ . Sketch the hoop stress and radial pressure across the thickness assuming zero external pressure. (07 Marks)

### Module-3

- 5 a. Define SF, BM and point of contraflexure. (03 Marks)
- b. A simply supported beam AB of span  $L$  is subjected to a concentrated load at distance 'a' from left support A. Develop expressions for SF and BM. Sketch SFD and BMD. (05 Marks)
- c. Sketch SFD and BMD for the beam shown in Fig.Q.5(c) indicating the salient points. (12 Marks)

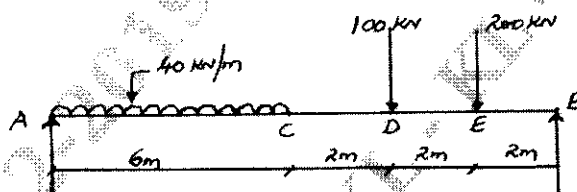


Fig.Q.5(c)

OR

- 6 a. Sketch SFD and BMD for the beam shown in Fig.Q.6(a) indicating salient points.

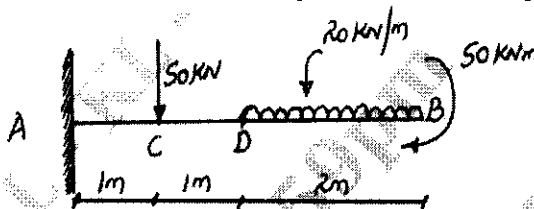


Fig.Q.6(a)

- b. Sketch SFD and BMD for the beam shown in Fig.Q.6(b) indicating salient points including point of contraflexure. (08 Marks)

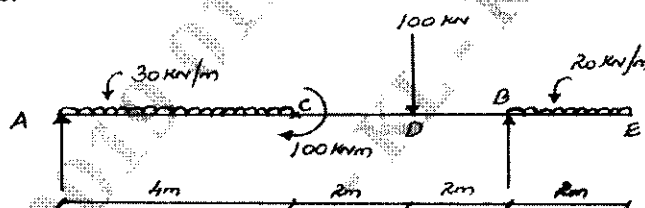


Fig.Q.6(b)

### Module-4

- 7 a. Derive the equation of pure bending  $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$  with usual notations. (10 Marks)
- b. A shaft of hollow C/S rotates at  $200 \text{ rpm}$  transmitting a power of  $800 \text{ kW}$  with internal diameter =  $0.8$  times external diameter. Compute the diameters if the maximum shear stress is limited to  $100 \text{ N/mm}^2$  and the angle of twist to  $1^\circ$  in a length of  $4 \text{ m}$ . Assume that the maximum torque is  $30\%$  greater than the mean torque and  $G = 80 \text{ GPa}$ . (10 Marks)

OR

- 8 a. State the assumptions made in the theory of pure torsion. (05 Marks)  
 b. Derive an expression for power transmitted by a shaft. (05 Marks)  
 c. A I-section consists of flanges  $200 \times 15$  with web 10mm thick. Total depth of the section is 500mm. If the beam carries a UDL of 35kN/m over a span of 8m, computer the bending and shear stresses at centre and support respectively. Sketch their distributions. (10 Marks)

**Module-5**

- 9 a. Derive an expression for slope and deflection in a simply supported subjected to UDL throughout. Calculate the maximum slope and deflection. (06 Marks)  
 b. Define:  
 i) Buckling load  
 ii) Effective length  
 iii) Slenderness ratio. (06 Marks)  
 c. Compute the crippling loads using Euler's and Rankine's formula for a hollow circular column 200mm external diameter and 25mm thick. The length of the column is 4m with both ends hinged. Assume  $E = 200\text{GPa}$ , Rankine's constants  $\sigma_c = 320\text{MPa}$  and  $a = 1/7500$ . (08 Marks)

OR

- 10 a. Derive an equation for buckling load in a long column with both ends hinged using Euler's column theory. (08 Marks)  
 b. Determine the slopes at A and B, deflections at C, D and E in the beam shown in Fig.Q.10(b) in terms of EI. (12 Marks)

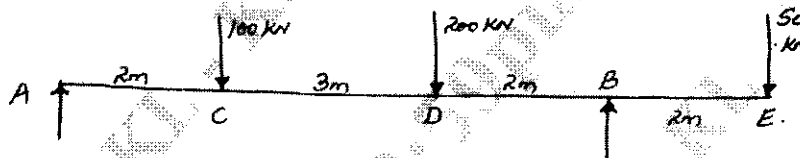


Fig.Q.10(b)

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18CV33

## Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Fluid Mechanics

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Define the following terms: (i) Ideal fluids and Real fluids. (06 Marks)  
(ii) Surface tension and capillarity. (06 Marks)
- b. State Newton's law of viscosity. Derive an expression for the same. (06 Marks)
- c. The space between the two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. The thickness of the oil film is 12.5 mm. The upper plate which moves at 2.5 m/s requires a force of 98.1 N to maintain the speed. Determine the dynamic viscosity of the oil in poise. Also find the kinematic viscosity of the oil in stokes, if the specific gravity of the is 0.95. (08 Marks)

OR

- 2 a. Explain with neat sketches the differential manometer and simple manometer. (06 Marks)
- b. Calculate the gauge pressure and absolute pressure at a point 3 m below the free surface of a liquid having a density of  $1.53 \times 10^3 \text{ kg/m}^3$ , if the atmospheric pressure is equivalent to 750 mm of mercury. (06 Marks)
- c. Petrol of specific gravity 0.8 flows upwards through a vertical pipe. A and B are two points in the pipe, B being 0.3 m higher than A, connections are led from A and B to a U tube containing mercury. If the difference of pressure between A and B is  $0.18 \text{ kgf/cm}^2$ . Find the difference in the mercury level in the differential manometer. (08 Marks)

### Module-2

- 3 a. Derive an expression for total pressure and centre of pressure on an inclined plane surface submerged in the liquid. (08 Marks)
- b. A circular plate of 3 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of centre of pressure. (06 Marks)
- c. In a two dimensional flow  $\phi = 3xy$  and  $\psi = \frac{3}{2}(y^2 - x^2)$ . Determine the velocity components at the points (1, 3) and (3, 3). Also find the discharge passing between the streamlines passing through the points given above. (06 Marks)

OR

- 4 a. Define : (i) Uniform flow and Non uniform flow. (06 Marks)  
(ii) Steady and Unsteady flow.  
(iii) Velocity potential and stream function. (06 Marks)
- b. A vertical gate closes a horizontal tunnel 3 m high and 3 m wide running full with water. The pressure at the bottom of the gate is  $196.2 \text{ kN/m}^2$ . Determine the total pressure on the gate and position of the centre of pressure. (08 Marks)
- c. Show that streamlines and equipotential lines form a set of perpendicular lines. (06 Marks)

### Module-3

- 5 a. Obtain an expression for Euler's equation of motion along a stream line and deduce it to Bernoulli's equation. (08 Marks)
- b. Define impulse momentum equation and give its applications. (04 Marks)

1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. A 300 mm diameter pipe carries water under a head of 20 m with a velocity of 3.5 m/s. If the axis of the pipe turns through  $45^\circ$ . Find the magnitude and direction of the resultant force at the bend. (08 Marks)

OR

- 6 a. Derive the equation for discharge through venturimeter. (08 Marks)  
 b. A venturimeter is to be fitted in a pipe of 0.25 m diameter where the pressure head is 7.6 m of flowing liquid and the maximum flow is  $8.1 \text{ m}^3/\text{minute}$ . Find the diameter of the throat of the venturimeter. Take  $C_d = 0.96$ . (06 Marks)  
 c. A pipeline carrying oil of specific gravity of 0.87 changes in diameter from 200 mm at a point A to 500 mm diameter at point B which is 4 m higher. If the pressure at A and B are  $9.81 \text{ N/cm}^2$  and  $5.886 \text{ N/cm}^2$  respectively and the discharge is  $200 \text{ l/s}$ . Determine the loss of head and direction of flow. (06 Marks)

Module-4

- 7 a. Define the hydraulic coefficients ( $C_c$ ,  $C_d$ ,  $C_v$ ) of an orifice and obtain the relation between them. (06 Marks)  
 b. Explain the classification of orifice and mouthpiece based on their shape, size, sharpness and discharge. (06 Marks)  
 c. Water flows through a triangular right angled weir first and then over a rectangular weir of 1 m width. The  $C_d$  values of triangular and rectangular weir are 0.6 and 0.7 respectively. If the depth of water over the triangular weir is 360 mm, find the depth of water over the rectangular weir. (08 Marks)

OR

- 8 a. Explain Cipolletti notch. What is the advantage of Cipolletti notch over trapezoidal notch. (06 Marks)  
 b. Water discharge at the rate of 98.2 litre/sec through a 120 mm diameter vertical sharp edged orifice placed under a constant head of 10 m. A point on the jet measured from the venacontracta of the jet has co-ordinate (4.5, 0.54). Find the coefficients  $C_c$ ,  $C_v$ ,  $C_d$  of the orifice. (08 Marks)  
 c. Derive an expression for discharge through a V-notch. (06 Marks)

Module-5

- 9 a. Explain major and minor losses in a pipe flow. Give an expression for head loss due to sudden expansion in pipe line. (08 Marks)  
 b. Three pipes of lengths 800 m, 500 m and 400 m and of diameters 500 mm, 400 mm and 300 mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700 m. Find the diameter of the single pipe. (06 Marks)  
 c. What is the maximum permissible velocity in a cast iron pipeline 10 mm diameter and 15 mm thick which can be suddenly stopped by a valve at the outlet end of the pipe without letting the rise of pressure in the pipe to exceed  $1.545 \times 10^3 \text{ kN/m}^2$ .  
 Take  $E$  for cast iron =  $123.606 \times 10^9 \text{ N/m}^2$ ,  $K$  for water =  $206.01 \times 10^7 \text{ N/m}^2$ . Neglect effect of Poisson's ratio. (06 Marks)

OR

- 10 a. Define the term compound pipe and equivalent pipe. Derive the expression for diameter of equivalent pipes. (06 Marks)  
 b. Explain Hardy cross method used in pipe networks. (06 Marks)  
 c. The population of a city is 8,00,000 and it is to be supplied with water from a reservoir 6.4 km away. Water is to be supplied at the rate of 140 litres per head per day and half the supply is to be delivered in 8 hours. The full supply level of the reservoir is RL 180.00 and its lowest water level is RL 105.00. The delivery end of the main is at RL 22.50 and the head required there is 12 m. Find the diameter of the pipe. Take  $f = 0.04$ . (08 Marks)

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2 of 2



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18CV34

## Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Building Materials and Construction

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Mention the importance of stones Bricks and Timber as construction materials. (06 Marks)  
b. Explain the manufacture process of Brick with necessary flow chart. (08 Marks)  
c. What is Bulking of Sand? Explain its importance in construction field. (06 Marks)

OR

- 2 a. What are the requirements of good building stones? (06 Marks)  
b. What are the constituents of good brick earth? Explain. (06 Marks)  
c. Which are the methods of seasoning of Timber? Describe them brief. (08 Marks)

### Module-2

- 3 a. Which are the functions of foundation? Explain them briefly. (06 Marks)  
b. Sketch the plan of alternate courses 1 brick thick wall in English bond. Mention its essential features. (08 Marks)  
c. What are the General principles to be observed in stone masonry? (06 Marks)

OR

- 4 a. Differentiate between strip footing and strap footing with sketches. (06 Marks)  
b. Sketch the elevation of Flemish bond and mention its special features. (08 Marks)  
c. Differentiate between uncoursed rubble masonry and Random rubble masonry with a sketch. (06 Marks)

### Module-3

- 5 a. Draw a neat sketch of an arch and Label its parts. (06 Marks)  
b. Explain the procedure for laying Marble flooring in Grand floor with a sketch. (06 Marks)  
c. Mention the requirements of good roof. Draw the sketch of wooden king post truss (half part). (08 Marks)

OR

- 6 a. Discuss various modes of failure of an arch. What are the remedies? (06 Marks)  
b. Explain the procedure for laying Mosaic flooring in ground floor with a sketch. (06 Marks)  
c. Draw the sketch of wooden Queen post truss (half part) and label its parts. (08 Marks)

### Module-4

- 7 a. Draw a sketch of a wooden door frame with shutter and label its parts. (06 Marks)  
b. What are the requirements of good stair? (06 Marks)  
c. What is meant by shoring? Explain Raking shore with a neat sketch. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. Write a note on Bay window with a sketch. (06 Marks)  
b. Plan a dog legged stair for a building in which the vertical distance between the floors is 3.6m. The stair hall measure 2.5m × 5m. (08 Marks)  
c. Write a note on Revolving Door with a neat sketch. (06 Marks)

**Module-5**

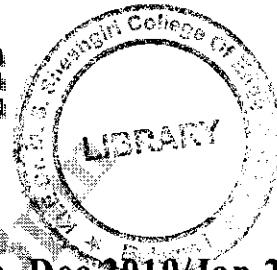
- 9 a. What are the requirements of plastering? (06 Marks)  
b. Explain various causes of Dampness in building. (06 Marks)  
c. Describe the constituents of a paint, mentioning the specific functions of each. (08 Marks)

OR

- 10 a. Write a note on various defects in plastering. (06 Marks)  
b. What are the ill effects of dampness in building? Explain them briefly. (06 Marks)  
c. Describe the procedure of painting: i) Newly plastered surfaces ii) Iron and steel surfaces. (08 Marks)

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18CV35

## Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Basic Surveying

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Define and explain plane and Geodetic surveying. (08 Marks)
- b. Name and Explain important sources of Errors in surveying. (06 Marks)
- c. Explain the terms Plans and Maps. Mention their application. (06 Marks)

OR

- 2 a. A field tape, standardized at 20°C measured 100.0056m. Determine the temperature at which it will be exactly of the nominal length of 100m. Take  $\alpha = 11.2 \times 10^{-6}$  per °C. (06 Marks)
- b. Name and explain the various instruments for chaining in surveying. (14 Marks)

### Module-2

- 3 a. Distinguish between prismatic and surveyor's compass. (08 Marks)
- b. Name and briefly explain temporary adjustments for prismatic compass. (06 Marks)
- c. Define local attraction and explain the Elimination of local attraction in compass surveying. (06 Marks)

OR

- 4 a. Explain with sketches an open traverse and closed traverse. (06 Marks)
- b. Determine the correct magnetic bearings of the liner. The following bearings were observed in running a closed traverse:

Line	F.B	B.B
AB	71° 05'	250° 20'
BC	110° 20'	292° 35'
CD	161° 35'	341° 45'
DE	220° 50'	40° 05'
EA	300° 50'	121° 10'

(14 Marks)

### Module-3

- 5 a. Define leveling and explain it. (04 Marks)
- b. Describe with neat sketch parts of dumpy level. (16 Marks)

OR

- 6 a. Explain the terms mentioning their purpose:
  - i) Station
  - ii) Back sight
  - iii) Turning point
  - iv) Height of Instruments.(08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- b. A level is set up on an extended line BA in a position 70m from A and 100m from B, reads 1.684m on a staff held at A and 2.122m on a staff held at B, the bubble having been carefully brought to the centre of its run before each reading. It is known that the reduced levels of the tops of the pegs at A and B are 89.62m and 89.222m respectively. Find:
- The Collimation error.
  - The Reading that would have been obtained had there been no Collimation error.
- (12 Marks)

**Module-4**

- 7 a. Explain the working operations of plane table. (06 Marks)  
 b. Explain Radiation and Traversing methods of plane table surveying with sketches. (08 Marks)  
 c. Describe with sketches two-point problem in plane table surveying. (06 Marks)

**OR**

- 8 a. Explain briefly Intersection and Resection Methods of plane table surveying with sketches. (10 Marks)  
 b. Describe the different Errors in plane table surveying. (10 Marks)

**Module-5**

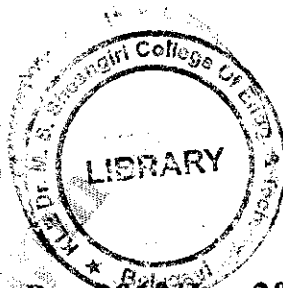
- 9 a. What are the General methods of determining Areas? (04 Marks)  
 b. A series of offsets were taken from a Chain line to a curved boundary line at Intervals of 15 meters in the following order 0, 2.65, 3.8, 3.75, 4.65, 3.6, 4.95, 5.85m. Computer the area between the chain line, the curved boundary and the end offsets by
- Average ordinate rule
  - Trapezoidal rule
  - Simpson's rule.
- (16 Marks)

**OR**

- 10 a. Explain with sketch planimeter. (07 Marks)  
 b. What are the methods of locating Contours in Surveying? (08 Marks)  
 c. Explain the calculation of the volume of the capacity of a reservoir with any one relationship. (05 Marks)

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# CBCS SCHEME



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18CV36

## Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Engineering Geology

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Discuss the scope of Geology in the field of Civil Engineering. (06 Marks)
- b. Explain the Internal structure and Composition of Earth. with neat sketch. (08 Marks)
- c. Write description of any two carbonate group of minerals. (06 Marks)

OR

- 2 a. Explain the physical properties of Mineral Hardness, Luster, Structure and Fracture. (12 Marks)
- b. Write the description of Minerals :  
i) Asbestos ii) Galena iii) Hematite iv) Gypsum. (08 Marks)

### Module-2

- 3 a. Define Igneous Rocks. Explain Formation and Forms of Igneous Rocks. (08 Marks)
- b. Write short note on Metamorphism. (06 Marks)
- c. Explain briefly Soil profil and Drainage patterns. (06 Marks)

OR

- 4 a. Write briefly selection of Rocks as materials for construction. (10 Marks)
- b. Explain the classification of sedimentary rocks and write the description of Sand stone and Conglomerate. (10 Marks)

### Module-3

- 5 a. Define Fault. With relevant sketch, explain parts and type of faults. (12 Marks)
- b. Write short note on Rock Quality Determination and Rock Structure Rating. (08 Marks)

OR

- 6 a. Define Dip and Strike. Discuss briefly selection of site for Dams. (12 Marks)
- b. Write difference between Faults and Joints. (08 Marks)

### Module-4

- 7 a. What is Aquifers? With neat sketch, explain types of Aquifers. (10 Marks)
- b. Discuss the Artificial Recharge and Rain Water Harvesting Methods. (10 Marks)

OR

- 8 a. Explain with a neat sketch, Ground Water Investigation by Electrical Resistivity Method. (10 Marks)
- b. Write short note on Hydrological cycle and Water pollution. (10 Marks)

### Module-5

- 9 a. Define Earthquake. With a neat sketch, explain Seismograph. (08 Marks)
- b. Write briefly Development of Remote Sensing. (06 Marks)
- c. Define Topography and Contour Maps. (06 Marks)

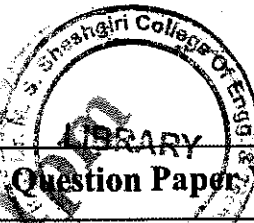
OR

- 10 Write short note on  
a. Global positioning system  
b. Tsunami.  
c. Soil creep.  
d. Components of GIS. (20 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.





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**Question Paper Version : C**

**Third Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Constitution of India and Professional Ethics and Cyber Law**

**(COMMON TO ALL BRANCHES)**

Time: 2 hrs.]

[Max. Marks: 100

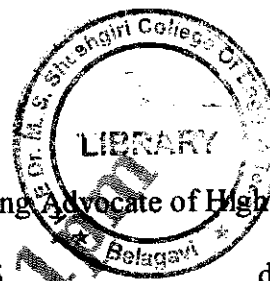
**INSTRUCTIONS TO THE CANDIDATES**

1. Answer all the Hundred questions, each question carries **ONE** mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

1. Who appoints Lieutenant Governor General to Delhi  
 a) PM                                      b) Law Minister                                      c) President                                      d) Vice - President
2. Who acts as a President when neither the President nor the Vice – President is available  
 a) Speaker of Lok Sabha                                      b) Attorney General of India  
 c) Chief Justice of India                                      d) Speaker of Rajya Sabha
3. How many judges are there in the SC including Chief Justice of India?  
 a) 15                                      b) 19                                      c) 25                                      d) 31
4. The Parliamentary system of the Indian Constitution is borrowed from  
 a) Britain Constitution                                      b) Objective Constitution  
 c) Canada Constitution                                      d) Australian Constitution
5. The final interpreter to the Indian Constitution is  
 a) Speaker of LS                                      b) Parliament                                      c) President                                      d) Supreme Court
6. The person arrested has to be produced before Magistrate within  
 a) 1 week                                      b) 24 hours                                      c) 72 hours                                      d) 2 months
7. Which is the language to be used in Parliament  
 a) Kannada                                      b) Hindi                                      c) English                                      d) Both (b) & (c)

Version C – 1 of 8

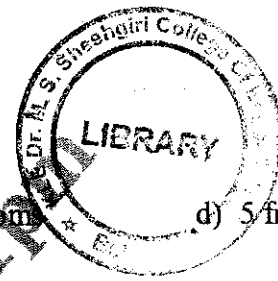




21. To become a Judge of High Court, one must be practicing Advocate of High Court for a period of atleast \_\_\_\_\_ years  
a) 20                      b) 10                      c) 15                      d) 5
22. The Constitution empowers State Government to make Special Law for  
a) Workers                      b) Teachers                      c) Women & Children                      d) Farmers
23. Directive principles come under \_\_\_\_\_ of the Constitution  
a) Part - II                      b) Part - III                      c) Part - IV                      d) Part - I
24. The system of Legislature in the State of Karnataka is  
a) Bicameral                      b) Unicameral                      c) Cameral                      d) Multi cameral
25. The Mandal Commission, was constituted relating to  
a) Reservation of SCs                      b) Reservation to STs  
c) Reservation                      d) Reservation to Backward classes
26. Who is appointing Chief Election Commissioner?  
a) Prime Minister                      b) Law Minister                      c) President                      d) Vice - President
27. Who is the Ex - Officio Chairman of Rajya Sabha?  
a) President                      b) Vice - President                      c) Prime Minister                      d) Governor
28. Vice - President of India is elected  
a) By the people  
b) By the members of State Legislature Assembly  
c) By the members of Rajya Sabha  
d) By the members of both the houses of Parliament at a joint sitting.
29. Which Amendment deals with the establishment of Municipalities a part of Constitution system?  
a) 44<sup>th</sup>                      b) 74<sup>th</sup>                      c) 76<sup>th</sup>                      d) 86<sup>th</sup>
30. Who appoints the Governor of the State?  
a) Chief Justice of India                      b) Chief Justice of State  
c) Chief Minister                      d) President
31. When the Indian Constitution enacted and adopted?  
a) 26/10/1949                      b) 26/12/1949                      c) 26/11/1949                      d) 26/01/1949
32. When the Indian Constitution gives effect  
a) 26/10/1949                      b) 26/12/1949                      c) 26/01/1950                      d) 26/01/1949
33. Which of the following word was added in the Preamble of the Constitution by 42<sup>nd</sup> Amendment Act 1976  
a) Socialist                      b) Sovereign                      c) Federal                      d) Republic
34. The President power to suspend death sentence temporarily is called  
a) Respite                      b) Reprieve                      c) Remission                      d) Constitution

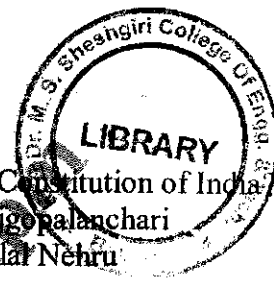
35. The Preamble of the Constitution has been amended so far  
 a) 4 times                      b) 3 times                      c) twice                      d) Once
36. Who are not entitled to form Union  
 a) Students                      b) Police                      c) Teachers                      d) Entrepreneurs
37. Which is not a Fundamental Right  
 a) Right against exploitation                      b) Right to freedom of religion  
 c) Right to strike                      d) Right to equality
38. Which of the following is not one of the 3 organs of state / Union  
 a) Executive                      b) Press                      c) Judiciary                      d) Legislation
39. How many Anglo Indians and others can be nominated by the President to the Lok Sabha and Rajyasabha  
 a) 2 & 12                      b) 2 & 10                      c) 1 & 12                      d) 1 & 10
40. Which state Constitution has removed by the Parliament of India?  
 a) West Bengal                      b) Nagaland                      c) Sikkim                      d) Jammu & Kashmir
41. When the office of the President falls vacant, the same must be filled up within  
 a) 4 months                      b) 6 months                      c) 12 months                      d) 18 months
42. The Preamble of the Constitution indicates  
 a) Power to make laws  
 b) The sovereign of Indian Constitution  
 c) Power of Parliament to amend the Constitution  
 d) Sources of Constitution
43. Which important human right is protected under Article 21  
 a) Right to Equality                      b) Right to life and liberty  
 c) Right to freedom of speech                      d) Right to religion
44. Right to Equality is guaranteed under Article  
 a) 13                      b) 15                      c) 16                      d) 14
45. No person shall be punished for same offence more than once  
 a) Jeopardy                      b) Double Jeopardy  
 c) Ex-post facto law                      d) Testimonial compulsion
46. The Rajya Sabha  
 a) Is a Permanent House                      b) Has a life of 6 years  
 c) Has a life of 5 years                      d) Has a life of 7 years
47. The Quorum of minimum number of members required to hold the meetings of either houses of the Parliament is  
 a) One - tenth                      b) One - fifth                      c) One - third                      d) One - fourth
48. The Advice of Supreme Court is  
 a) Binding on the President  
 b) Not binding on the President  
 c) Binding on the President if it is tendered unanimously  
 d) None of these





49. Article 19 provides  
a) 6 freedoms                      b) 7 freedoms                      c) 8 freedoms                      d) 5 freedoms
50. Who is the present speaker of Lok Sabha  
a) Sumithra Mahajan              b) K.S Hegde                      c) Om Birla                      d) Venkiah Naidu
51. Which is the landmark Judgement passed by the Supreme Court in respect to Preamble of Constitution  
a) Beur beri                      b) Keshavananda Bharathi  
c) Menaka Gandhi                      d) Sonia Gandhi
52. Who is the neutral person in the affairs of party politics  
a) C.M                      b) Home Minister                      c) Finance Minister                      d) Speaker
53. Indian Constitution guarantees reservation of seats to SC & ST in  
a) Lok Sabha and Assembly                      b) Lok Sabha only  
c) Lok Sabha and Rajya Sabha                      d) Rajya Sabha
54. Who will preside over the joint session of both the houses of the Parliament  
a) President                      b) Prime Minister                      c) Speaker                      d) Law Minister
55. What is the minimum age for becoming M.P in Rajya Sabha and Lok Sabha  
a) 18 and 25                      b) 25 and 18                      c) 25 and 30                      d) 30 and 25
56. India is referred to as \_\_\_\_\_ under the Indian Constitution  
a) Country                      b) Hindustan                      c) India                      d) Bharat
57. The citizens can enforce their Fundamental Rights before SC under  
a) Article 31                      b) Article 32                      c) Article 33                      d) Article 34
58. Who quoted "Child of Today is Citizen of Tomorrow"?  
a) L. Tilak                      b) Jawaharlal Nehru                      c) B.R. Ambedkar                      d) Gandhiji
59. What is the minimum age required for casting of Vote  
a) 18                      b) 19                      c) 20                      d) 21
60. Who quoted "Freedom is my birth right"?  
a) L. Tilak                      b) Jawaharlal Nehru                      c) Sardar Patel                      d) Gandhiji
61. Salaries and other emoluments of the High Court Judges shall be determined by the  
a) Governor                      b) Parliament                      c) Chief Minister                      d) State Legislature
62. According to 74<sup>th</sup> Amendment Act of 1993, which subject has been incorporated?  
a) Municipalities                      b) Co-operative Society  
c) Gram Panchayat                      d) Taluk Panchayat
63. IP Sec is designed to withstand replay attacks through the use of  
a) Sequence numbers                      b) Nonces  
c) Nonces + Sequence numbers                      d) Timestamps

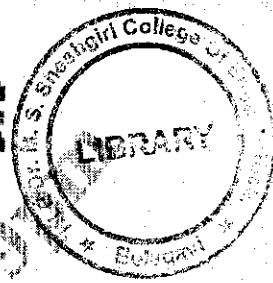
64. The Key Confirmation Key [KCK] is used to
- Integrity – protect data between the station and the AP
  - Integrity – protect messages in the four – way hand shake
  - Encrypt data between the station and the AP
  - Encrypt the message containing the group key.
65. Which of the following is true in a Smurf Attack?
- The Victim receives large number of UDP packers to non – listening ports
  - The Victim receives large number of TCP SYN – ACK packers
  - The Victim receives large number of ICMP “Echo Request” messages
  - The Victim receives large number of ICMP “Echo Reply” messages.
66. A persistent cross – site scripting attack saves malicious code on
- The client
  - The server
  - Both client & server
  - Neither (a) & (b)
67. The possible goal of an attacker is sending packets with invalid combinations of TCP header flag is to
- Launch a SYN flood attack
  - Find which services are open
  - Perform OS finger printing
  - Determine the addressing schema within an organisation
68. The SOAP binding refers to
- The object bound to a SOAP message
  - The XML schema of a SOAP message
  - The mapping between a SOAP message underlying transport protocol
  - The headers in a SOAP message
69. The EKE protocol is resistant to
- Replay attacks
  - Man – in – the middle attacks
  - Dictionary attacks
  - Reflection attacks
70. The SIM authenticates itself to the MSC/HLR using
- A user password
  - A digital certificate
  - A response to a challenge
  - An encrypted signaling message.
71. One of the salient features of our constitution is
- It is fully rigid
  - It is fully flexible
  - It is partly rigid and partly flexible
  - None of these
72. A person to be appointed as a Governor of a State must have completed the age of
- 30 years
  - 35 years
  - 45 years
  - 50 years
73. The Chief Election Commission holds office for a period of
- 3 years
  - 6 years
  - 5 years
  - 6 years or till he attains age of 65 years
74. The procedure for amending the constitution is detailed under
- Article 360
  - Article 368
  - Article 352
  - Article 301
75. Writ of Mandamus can be issued on the ground of
- Non – performance of public duties
  - Unlawful Detention
  - Unlawful occupation of public office
  - None of these



76. Who acted as the Chairman of the drafting committee of the Constitution of India?  
a) Dr. B.R. Ambedkar  
b) B.C. Rajgopalachari  
c) Dr. Rajendra Prasad  
d) Jawaharlal Nehru
77. Engineering Ethics is  
a) A macro Ethics  
b) Business Ethics  
c) A developing Ethics  
d) A code of Scientific rules based on Ethics
78. The use of intellectual property of others without permission or credit is referred as  
a) Cooking  
b) Stealing  
c) Plagiarism  
d) Trimming.
79. Who is the chair person of Parliament  
a) CM  
b) PM  
c) FM  
d) Speaker
80. Who will impeach the Chief Justice of India  
a) Supreme Court  
b) Law Minister  
c) 2/3<sup>rd</sup> Majority of Parliament  
d) By Rajya Sabha
81. Uniform Civil code means  
a) A code related to individuals public life  
b) A code meant for Hindu only  
c) A Civil procedure code  
d) A Codified Law applicable to all person of India irrespective of their religion
82. The Vice – President has power  
a) To sign bills passed by Rajya Sabha  
b) To preside over Rajya Sabha  
c) To nominate two members for Rajya Sabha  
d) To propagate ordinance
83. Parliament of India consists of  
a) Lok Sabha  
b) Lok Sabha & Rajya Sabha  
c) Only Rajya Sabha  
d) None of these
84. A National emergency can remain in operation with the approval of Parliament for  
a) An indefinite period  
b) A maximum period of 6 months  
c) A maximum period of 1 year  
d) A maximum period of 3 years
85. In Engineering research and testing, retaining the contradictory statement, discarding the rest is called  
a) Trimming  
b) Scanning  
c) Cooking  
d) Skimming
86. The Chief Justice and other Judges of High Court are appointed by  
a) President  
b) Chief Minister  
c) Prime Minister  
d) Governor
87. The terms 'Ethics' is derived from  
a) Ethical in English  
b) Ethic in Latin  
c) Custom  
d) Ethicos in Greek
88. The aim of the Directive Principles of State Policy is to establish  
a) Capitalist State in Our Country  
b) Communist State in Our Country  
c) Welfare State in the Country  
d) All of these
89. Special majority means more than  
a) 50% majority  
b) Two – third majority  
c) 75% majority  
d) 60 – majority

90. One way of misusing the truth is  
 a) Exaggerating the truth  
 b) Making wrong statement  
 c) Making confused statement  
 d) Failure to seek out the truth
91. The Chief Justice of High – Court is appointed by  
 a) President  
 b) Chief Minister  
 c) Prime Minister  
 d) Governor
92. Which is Not a Fundamental right  
 a) Right to freedom  
 b) Right to Constitutional remedy  
 c) Right to property  
 d) Right to equality
93. The tenure of Vice – President  
 a) 2 years  
 b) 5 years  
 c) 3 years  
 d) 1 year
94. How many Schedules are there in Indian Constitution?  
 a) 7  
 b) 5  
 c) 12  
 d) 6
95. The membership of Legislative Assembly of State varies between  
 a) 60 & 500  
 b) 100 & 300  
 c) 150 & 450  
 d) 100 & 400
96. According to Indian Constitution, the power of amending the Constitution is vested with  
 a) Parliament  
 b) President  
 c) People  
 d) The Prime Minister of India
97. Engineers can use code of ethics as guidelines to  
 a) Resolve the conflicts  
 b) Formulate the problem  
 c) Shift of Responsibility  
 d) Overcome the work pressure
98. What is the maximum strength of Lok Sabha  
 a) 500  
 b) 545  
 c) 552  
 d) 550
99. Union list has  
 a) 95 subjects  
 b) 97 subjects  
 c) 105 subjects  
 d) 66 subjects
100. The Fundamental Rights of Indian citizen are contained in  
 a) Part – III of Constitution  
 b) Part – IV of Constitution  
 c) The 7<sup>th</sup> Schedule of Constitution  
 d) None of these

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17MAT41

## Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Engineering Mathematics - IV

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

1. a. From Taylor's series method, find  $y(0.1)$ , considering upto fourth degree term if  $y(x)$  satisfying the equation  $\frac{dy}{dx} = x - y^2$ ,  $y(0) = 1$ . (06 Marks)
- b. Using Runge-Kutta method of fourth order  $\frac{dy}{dx} + y = 2x$  at  $x = 1.1$  given that  $y = 3$  at  $x = 1$  initially. (07 Marks)
- c. If  $\frac{dy}{dx} = 2e^x - y$ ,  $y(0) = 2$ ,  $y(0.1) = 2.010$ ,  $y(0.2) = 2.040$  and  $y(0.3) = 2.090$ , find  $y(0.4)$  correct upto four decimal places by using Milne's predictor-corrector formula. (07 Marks)

OR

2. a. Using modified Euler's method find  $y$  at  $x = 0.2$ , given  $\frac{dy}{dx} = 3x + \frac{1}{2}y$  with  $y(0) = 1$  taking  $h = 0.1$ . (06 Marks)
- b. Given  $\frac{dy}{dx} + y + zy^2 = 0$  and  $y(0) = 1$ ,  $y(0.1) = 0.9008$ ,  $y(0.2) = 0.8066$ ,  $y(0.3) = 0.722$ . Evaluate  $y(0.4)$  by Adams-Bashforth method. (07 Marks)
- c. Using Runge-Kutta method of fourth order, find  $y(0.2)$  for the equation  $\frac{dy}{dx} = \frac{y-x}{y+x}$ ,  $y(0) = 1$ , taking  $h = 0.2$ . (07 Marks)

### Module-2

3. a. Apply Milne's method to compute  $y(0.8)$  given that  $\frac{d^2y}{dx^2} = 1 - 2y \frac{dy}{dx}$  and the following table of initial values.

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y'	0	0.1996	0.3937	0.5689

- b. Express  $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$  in terms of Legendre polynomials. (06 Marks)
- c. Obtain the series solution of Bessel's differential equation  $x^2y'' + xy' + (x^2 + n^2)y = 0$  leading to  $J_n(x)$ . (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 a. Given  $y'' - xy' - y = 0$  with the initial conditions  $y(0) = 1$ ,  $y'(0) = 0$ , compute  $y(0.2)$  and  $y'(0.2)$  using fourth order Runge-Kutta method. (06 Marks)
- b. Prove  $J_{-1/2}(k) = \sqrt{\frac{2}{\pi x}} \cos x$ . (07 Marks)
- c. Prove the Rodrigues formula  $P_n(x) = \frac{1}{2^n n!} \frac{d^n y}{dx^n} (x^2 - 1)^n$  (07 Marks)

**Module-3**

- 5 a. Derive Cauchy-Riemann equations in Cartesian form. (06 Marks)
- b. Discuss the transformation  $w = z^2$ . (07 Marks)
- c. By using Cauchy's residue theorem, evaluate  $\int_C \frac{e^{2z}}{(z+1)(z+2)} dz$  if C is the circle  $|z| = 3$ . (07 Marks)

OR

- 6 a. Prove that  $\left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |f(z)|^2 = 4|f'(z)|^2$  (06 Marks)
- b. State and prove Cauchy's integral formula. (07 Marks)
- c. Find the bilinear transformation which maps  $z = \infty, i, 0$  into  $w = -1, -i, 1$ . (07 Marks)

**Module-4**

- 7 a. Find the mean and standard of Poisson distribution. (06 Marks)
- b. In an examination 7% of students score less than 35 marks and 89% of the students score less than 60 marks. Find the mean and standard deviation if the marks are normally distributed given  $A(1.2263) = 0.39$  and  $A(1.4757) = 0.43$  (07 Marks)
- c. The joint probability distribution table for two random variables X and Y is as follows:

	Y	-2	-1	4	5
X					
1		0.1	0.2	0	0.3
2		0.2	0.1	0.1	0

Determine:

- i) Marginal distribution of X and Y
- ii) Covariance of X and Y
- iii) Correlation of X and Y

(07 Marks)

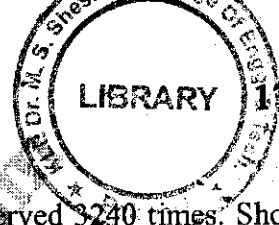
OR

- 8 a. A random variable X has the following probability function:

x	0	1	2	3	4	5	6	7
P(x)	0	K	2k	2k	3k	K <sup>2</sup>	2k <sup>2</sup>	7k <sup>2</sup> +k

Find K and evaluate  $P(x \geq 6)$ ,  $P(3 < x \leq 6)$ . (06 Marks)

- b. The probability that a pen manufactured by a factory be defective is  $1/10$ . If 12 such pens are manufactured, what is the probability that
- i) Exactly 2 are defective
- ii) Atleast two are defective
- iii) None of them are defective. (07 Marks)
- c. The length of telephone conversation in a booth has been exponential distribution and found on an average to be 5 minutes. Find the probability that a random call made
- i) Ends in less than 5 minutes
- ii) Between 5 and 10 minutes. (07 Marks)



**Module-5**

- 9 a. A die is thrown 9000 times and a throw of 3 or 4 was observed 3240 times. Show that the die cannot be regarded as an unbiased die. (06 Marks)
- b. A group of 10 boys fed on diet A and another group of 8 boys fed on a different diet B for a period of 6 months recorded the following increase in weight (lbs):

Diet A:	5	6	8	1	12	4	3	9	6	10
Diet B:	2	3	6	8	10	1	2	8		

Test whether diets A and B differ significantly  $t_{0.05} = 2.12$  at 16df. (07 Marks)

- c. Find the unique fixed probability vector for the regular stochastic matrix

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$$

(07 Marks)

OR

- 10 a. Define the terms:
- i) Null hypothesis
  - ii) Type-I and Type-II error
  - iii) Confidence limits

(06 Marks)

- b. The t.p.m. of a Markov chain is given by  $P = \begin{bmatrix} 1/2 & 0 & 1/2 \\ 1 & 0 & 0 \\ 1/4 & 1/2 & 1/4 \end{bmatrix}$ . Find the fixed probabilities vector. (07 Marks)

- c. Two boys  $B_1$  and  $B_2$  and two girls  $G_1$  and  $G_2$  are throwing ball from one to another. Each boy throws the ball to the other boy with probability  $1/2$  and to each girl with probability  $1/4$ . On the other hand each girl throws the ball to each boy with probability  $1/2$  and never to the other girl. In the long run how often does each receive the ball? (07 Marks)

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17MATDIP41

## Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Additional Mathematics – II

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Find the rank of the matrix:

$$A = \begin{bmatrix} 2 & 3 & 5 & 4 \\ 0 & 2 & 3 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix} \text{ by elementary row transformations.} \quad (08 \text{ Marks})$$

- b. Solve by Gauss elimination method

$$\begin{aligned} 2x + y + 4z &= 12 \\ 4x + 11y - z &= 33 \\ 8x - 3y + 2z &= 20 \end{aligned} \quad (06 \text{ Marks})$$

- c. Find all the eigen values for the matrix  $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$  (06 Marks)

OR

- 2 a. Reduce the matrix

$$\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix} \text{ into its echelon form and hence find its rank.} \quad (06 \text{ Marks})$$

- b. Applying Gauss elimination method, solve the system of equations

$$\begin{aligned} 2x + 5y + 7z &= 52 \\ 2x + y - z &= 0 \\ x + y + z &= 9 \end{aligned} \quad (06 \text{ Marks})$$

- c. Find all the eigen values for the matrix  $A = \begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$  (08 Marks)

### Module-2

- 3 a. Solve  $\frac{d^4 y}{dx^4} - \frac{2d^3 y}{dx^3} + \frac{d^2 y}{dx^2} = 0$  (06 Marks)

- b. Solve  $\frac{d^2 y}{dx^2} - \frac{6dy}{dx} + 9y = 5e^{-2x}$  (06 Marks)

- c. Solve  $\frac{d^2 y}{dx^2} + y = \sec x$  by the method of variation of parameters. (08 Marks)

OR

- 4 a. Solve  $\frac{d^3 y}{dx^3} + y = 0$  (06 Marks)

- b. Solve  $y'' + 3y' + 2y = 12x^2$  (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

- c. Solve by the method of undetermined coefficients :

$$y'' - 4y' + 4y = e^x$$

(08 Marks)

**Module-3**

- 5 a. Find the Laplace transforms of  $\sin 5t \cos 2t$  (06 Marks)  
 b. Find the Laplace transforms of  $(3t + 4)^3$  (06 Marks)  
 c. Express  $f(t) = \begin{cases} \sin 2t & 0 < t < \pi \\ 0 & t > \pi \end{cases}$ ,  
 in terms of unit step function and hence find  $L[f(t)]$ . (08 Marks)

**OR**

- 6 a. Find the Laplace transforms of  $\frac{\sin 5t}{t}$  (06 Marks)  
 b. Find the Laplace transform of  $2^t + t \sin t$  (06 Marks)  
 c. If  $f(t) = t^2$ ,  $0 < t < 2$  and  $f(t+2) = f(t)$ , for  $t > 2$ , find  $L[f(t)]$ . (08 Marks)

**Module-4**

- 7 a. Find the Laplace Inverse of  $\frac{1}{(s+1)(s-1)(s+2)}$  (08 Marks)  
 b. Find the inverse Laplace transform of  $\frac{3s+7}{s^2-2s-3}$  (06 Marks)  
 c. Solve  $y'' + 2y' - 3y = \sin t$ ,  $y(0) = 0$ ,  $y'(0) = 0$ . (06 Marks)

**OR**

- 8 a. Find the inverse Laplace transform of  $\log\left(\frac{s+a}{s+b}\right)$  (06 Marks)  
 b. Find the inverse Laplace transform of  $\frac{4s-1}{s^2+25}$  (06 Marks)  
 c. Find the inverse Laplace of  $y'' - 5y' + 6y = e^t$  with  $y(0) = y'(0) = 0$ . (08 Marks)

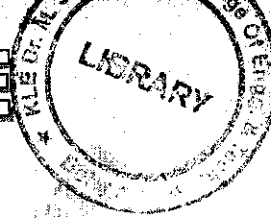
**Module-5**

- 9 a. State and prove Addition theorem on probability. (05 Marks)  
 b. A student A can solve 75% of the problems given in the book and a student B can solve 70%. What is the probability that A or B can solve a problem chosen at random. (06 Marks)  
 c. Three machines A, B, C produce 50%, 30% and 20% of the items in a factory. The percentage of defective outputs of these machines are 3, 4 and 5 respectively. If an item is selected at random, what is the probability that it is defective? If a selected item is defective, what is the probability that it is from machine A? (09 Marks)

**OR**

- 10 a. Find the probability that the birth days of 5 persons chosen at random will fall in 12 different calendar months. (05 Marks)  
 b. A box A contains 2 white balls and 4 black balls. Another box B contains 5 white balls and 7 black balls. A ball is transferred from box A to box B. Then a ball is drawn from box B. Find the probability that it is white. (06 Marks)  
 c. State and prove Baye's theorem. (09 Marks)

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17CV42

**Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Analysis of Determinate Structures**

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

**Module-1**

1. a. Explain the different types of trusses, with neat sketches. (04 Marks)
- b. State the assumptions made in the analysis of truss. (04 Marks)
- c. Find the forces in all members of the pin jointed truss shown in Fig.Q1(c) by method of joints. (04 Marks)

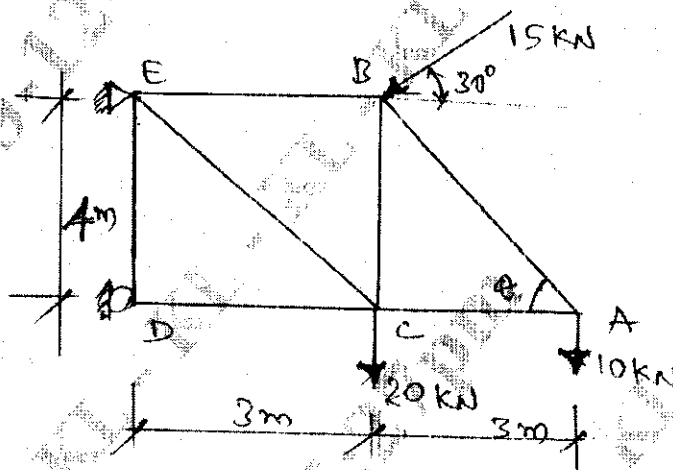


Fig.Q1(c)

(12 Marks)

OR

2. a. Differentiate between statically determinate and indeterminate structures. (04 Marks)
- b. Explain linear and non linear systems. (04 Marks)
- c. Find the forces in the members EB, EC and DC by method of sections shown in Fig.Q2(c). (04 Marks)

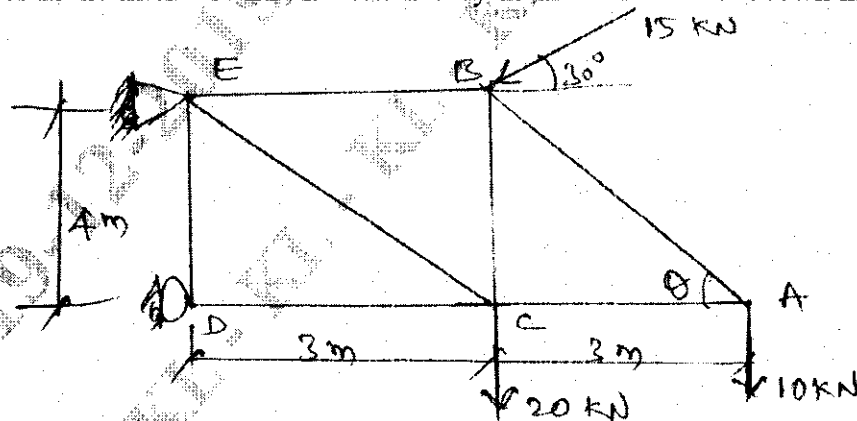


Fig.Q2(c)

(12 Marks)

**Module-2**

3. a. State the first and second moment area theorems. (04 Marks)
- b. Derive the Moment Curvature Equation for deflection. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. Determine slope and deflection for the simply supported beam subjected to point load at mid span shown in Fig.Q3(c).

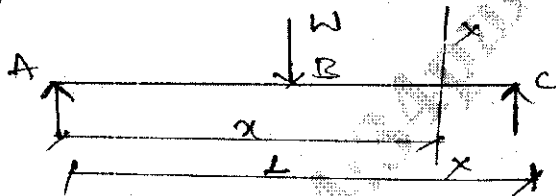


Fig.Q3(c)

(10 Marks)

OR

- 4 a. Find the maximum slope and deflection at free end for the loaded beam shown in Fig.Q4(a) by Moment Area method.

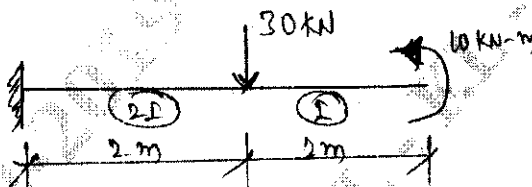


Fig.Q4(a)

(10 Marks)

- b. Determine the slope and deflection of the cantilever beam shown in Fig.Q4(b), using conjugate beam method.

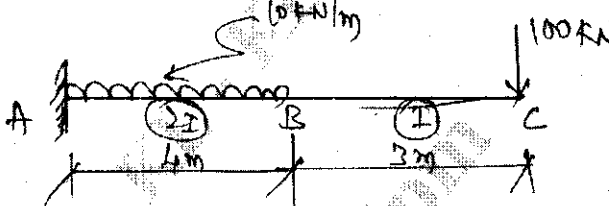


Fig.Q4(b)

(10 Marks)

**Module-3**

- 5 a. Derive the expression for strain energy stored in an prismatic element subjected to pure bending moment. (08 Marks)  
 b. Determine the deflection at the center of the loaded simply supported beam as shown in Fig.Q5(b) by Castiglian's theorem.

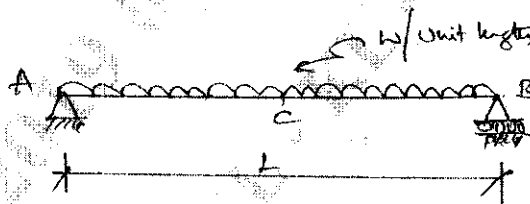


Fig.Q5(b)

(12 Marks)

OR

- 6 a. Determine the horizontal displacement of the roller support end A of the frame shown in Fig.Q6(a), take  $EI = 8000 \text{ kN-m}^2$  by unit load method.

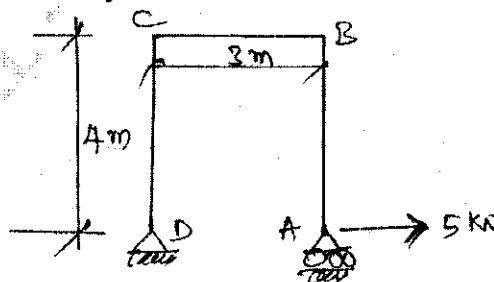


Fig.Q6(a)

(10 Marks)

- b. Determine the deflection at the load point for the beam shown in Fig.Q6(b) by using strain energy method.

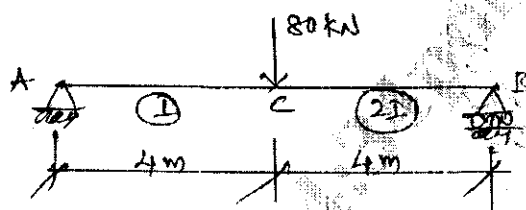


Fig.Q6(b)

(10 Marks)

**Module-4**

- 7 a. Show that  $L_c = L + \frac{8h^2}{3L}$  for a cable of span  $L$  and UDL of intensity  $W$  kN-m. (08 Marks)
- b. A three hinged parabolic arch of span 24 m rise 6 m with hinged at abutments and at crown point. Arch subjected to a point loads of 50 kN and 150 kN at a distance of 8m and 20 m from left supports, determine, reactions at supports, radial shear and normal thrust at a distance of 6m both from left and right support and draw Bending Moment Diagram. (12 Marks)

OR

- 8 a. A cable of 20 m and dip 4m carries a UDL of 20 kN-m over the whole span, find the maximum tension in the cable and length of the cable. (08 Marks)
- b. A three hinged parabolic arch is having a span of 36 m. It is subjected to UDL 30 kN/m from left support hinge to crown hinge. Determine the normal thrust, radial shear and bending moment at quarter span point located from left support. (12 Marks)

**Module-5**

- 9 a. What are the uses of influence line diagram? (04 Marks)
- b. Draw the influence line diagram for shear force at a section for a simply supported beam subjected to single point load. (06 Marks)
- c. Find the shear force at the section G for the loaded simply supported beam by using influence line diagram. Also find shear forces. [Refer Fig.Q9(c)]

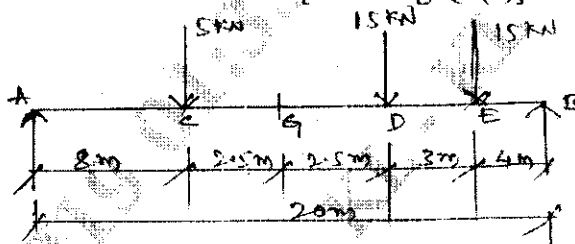


Fig.Q9(c)

(10 Marks)

OR

- 10 a. Explain the procedure for generating influence line diagrams. (04 Marks)
- b. Determine the influence line diagram for the forces in the members  $U_1U_2$   $U_2U_3$   $L_2L_3$   $U_2L_2$  and  $U_2L_3$  for the part truss as shown in Fig.Q10(b).

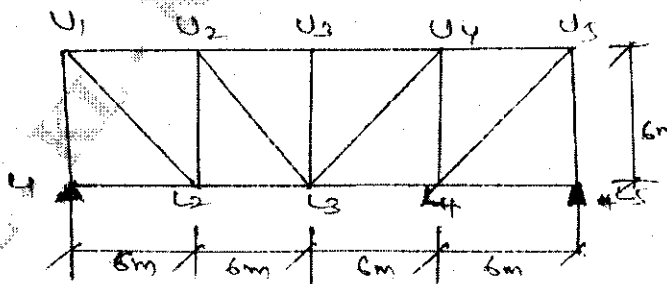


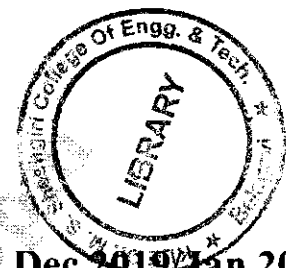
Fig.Q10(b)

(16 Marks)

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17CV43

**Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Applied Hydraulics**

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

**Module-1**

- 1 a. Define the terms: (i) Model (ii) Prototype  
 (iii) Model analysis (iv) Hydraulic similitude (06 Marks)
- b. In 1 in 40 model of spillway the velocity and discharge are 2m/s and 2.5 m<sup>3</sup>/s. Find the corresponding velocity and discharge in the prototype. (04 Marks)
- c. Using Buckingham's  $\pi$ -theorem, derive the following relationship  $R = \rho V^2 D^2 \phi \left( \frac{\mu}{\rho V D}, \frac{H}{D} \right)$   
 where R = resistance,  $\rho$  = density, V = velocity of flow, D = diameter,  $\mu$  = viscosity and H = height. (10 Marks)

OR

- 2 a. Explain the types of similarities in model analysis. (06 Marks)
- b. A pipe of diameter 1.8 m is required to transport an oil of specific gravity 0.8 and viscosity 0.04 poise at the rate of 4 m<sup>3</sup>/s. Tests were conducted on a 20 cm diameter pipe using water at 20°C. Find the velocity and rate of flow in model, viscosity of water at 20°C is 0.01 poise. (08 Marks)
- c. Explain the experimental method of determination of meta-centric height. (06 Marks)

**Module-2**

- 3 a. Distinguish between pipe flow and open channel flow. (04 Marks)
- b. Derive Chezy's equation for uniform flow in open channel with usual notations. (08 Marks)
- c. A trapezoidal channel with side slopes 3H:2V has to be designed to carry 10 m<sup>3</sup>/s at velocity of 1.5 m/s, so that the amount of concrete lining for the bed and sides is minimum. Find:  
 (i) The wetted perimeter (ii) Slope of bed if Manning's N = 0.014 (08 Marks)

OR

- 4 a. For most economical trapezoidal section show that half of the top width is equal to one of the side slope length. (06 Marks)
- b. Explain with neat sketch the specific energy curve. (06 Marks)
- c. A discharge of 18 m<sup>3</sup>/s flows through a rectangular channel 6m wide at a depth of 1.6 m. Find: (i) specific energy (ii) critical depth (iii) critical velocity (iv) value of minimum specific energy. (08 Marks)

**Module-3**

- 5 a. Define the term hydraulic jump. Derive an expression for a hydraulic jump in a horizontal rectangular channel. (10 Marks)
- b. Find the slope of the free water surface in a rectangular channel of width 20 m having depth of flow 5m. The discharge through the channel is 50 m<sup>3</sup>/s. The bed of the channel is having a slope of 1 in 4000. Take the value of Chezy's constant C = 60. (10 Marks)

OR

- 6 a. Explain the following slope profiler, (i) Critical slope (ii) Mild slope (iii) Steep slope and also draw profile of  $M_1$ ,  $M_2$  and  $M_3$ . (10 Marks)
- b. A sluice gate discharges water into a horizontal channel with a velocity of 5m/s and depth of flow is 0.4 m. The width of the channel is 6m. Determine whether a hydraulic jump will occur, and if so find its height and loss of energy per kg of water. Also determine the power lost in the hydraulic jump. (10 Marks)

**Module-4**

- 7 a. Find an expression for the efficiency of a series of moving curved vanes when a jet of water strikes the vanes at one of the tips. Prove that maximum efficiency is 50% when  $u > v$ . (10 Marks)
- b. A pelton wheel has to develop 13200 KW under a net head of 820 m while running at a speed of 600 rpm. If the coefficient of jet  $C_v = 0.98$ , speed ratio  $\phi = 0.46$  and jet diameter is  $\frac{1}{16}$  of wheel diameter, calculate (i) pitch circle diameter (ii) the diameter of the jet (iii) quantity of water supplied to the wheel (iv) Number of jets required. Assume overall efficiency as 85%. (10 Marks)

OR

- 8 a. Draw a neat sketch of a layout of hydroelectric power plant and explain the functions of each component. Also define different heads. (10 Marks)
- b. A jet of water having a velocity of 35 m/s impinges on a series of vanes moving with a velocity of 20 m/s. The jet makes an angle of  $30^\circ$  to the direction of vanes when entering and leaves at an angle of  $120^\circ$ . Draw the triangles of velocities at inlet and outlet and find,  
 (i) The angles of vanes tips so that water enters and leaves without shock.  
 (ii) The work done per unit weight of water entering the vanes  
 (iii) Efficiency. (10 Marks)

**Module-5**

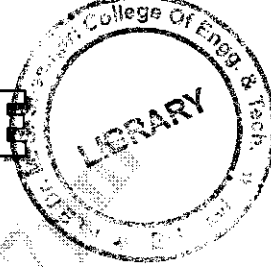
- 9 a. What is a draft tube? What are the functions of draft tube? (04 Marks)
- b. Derive the expression for minimum starting speed of a centrifugal pump. (06 Marks)
- c. A Kaplan turbine develops 24647.6 KW power at an average head of 39 m. Assuming the speed ratio of 2, flow ratio of 0.6, diameter of boss equals to 0.35 times the diameter of runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine. (10 Marks)

OR

- 10 a. Explain manometric efficiency, mechanical efficiency and overall efficiency of a centrifugal pump. (06 Marks)
- b. Define unit head, unit discharge and unit power. (04 Marks)
- c. A centrifugal pump is to deliver  $0.12 \text{ m}^3/\text{s}$  at a speed of 1450 rpm against a head of 25 m. The impeller diameter is 250 mm, width at outlet is 50 mm. The manometric efficiency is 75%. Determine the vane angles at the outer periphery of the impeller. (10 Marks)

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17CV/CT44

## Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Concrete Technology

Time: 3 hrs.

Max. Marks: 100

**Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. IS - 10262 mix design code is allowed.

### Module-1

- 1 a. Explain the manufacturing process of cement by wet process using flow chart. (10 Marks)  
b. Name chemical and mineral admixtures and explain flyash and Metakaolin admixtures in detail. (10 Marks)

OR

- 2 a. Define Hydrating Cement. With schematic representation, explain structure of hydrated cement paste. (08 Marks)  
b. Name the alternatives of River sand and explain the properties of M - Sand. (06 Marks)  
c. Explain the importance of Aggregate in concrete. (06 Marks)

### Module-2

- 3 a. Explain two laboratory tests for measurement of workability. (10 Marks)  
b. Explain the manufacturing process of concrete. (10 Marks)

OR

- 4 a. Explain the methods of curing. (10 Marks)  
b. Describe the effect of heat of hydration during mass concreting at project sites. (05 Marks)  
c. Explain Segregation and Bleeding. (05 Marks)

### Module-3

- 5 a. Explain the factors influence the strength of Hardened concrete. (06 Marks)  
b. What are the factors which affects the creep? (04 Marks)  
c. Explain the types of Shrinkage in concrete. (10 Marks)

OR

- 6 a. What are the Internal and External factors influence the durability of concrete? (12 Marks)  
b. Briefly explain the Rebound hammer test and Ultrasonic pulse velocity test. (08 Marks)

### Module-4

- 7 a. Explain the concept of mix design. (06 Marks)  
b. List out the data required for mix proportioning. (04 Marks)  
c. Write the steps involved in the methods of mix design. (10 Marks)

OR

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 8 Design a concrete mix for M<sub>35</sub> grade using fly ash. Other data are given below :
- |  |                      |
|--|----------------------|
| a. Type of cement  | OPC 43 grade         |
| b. Type of flyash  | F type               |
| c. Maximum size of aggregate   | 20 mm                |
| d. Minimum cement content  | 320kg/m <sup>3</sup> |
| e. Maximum water cement ratio  | 0.45                 |
| f. Workability   | 100 mm slump         |
| g. Exposure condition  | Severe (RCC)         |
| h. Method of placing concrete  | Pumping              |
| i. Degree of supervision   | good                 |
| j. Chemical admixture  | Super plasticizer    |
| k. Specific gravity of cement  | 3.15                 |
| l. Specific gravity of fly ash   | 2.2                  |
| m. Specific gravity of coarse aggregate  | 2.78                 |
| n. Specific gravity of fine aggregate  | 2.70                 |
| o. Water absorption :  |                      |
| i) Coarse aggregate  | 0.5%                 |
| ii) Fine aggregate   | Nil                  |
| p. Free surface moisture   |                      |
| i) Coarse aggregate  | Nil                  |
| ii) Fine aggregate   | 1.5%                 |
| q. Grading of coarse aggregate is conforming to table 2 of IS 383 and grading of fine aggregate is falling Zone I. | (20 Marks)           |

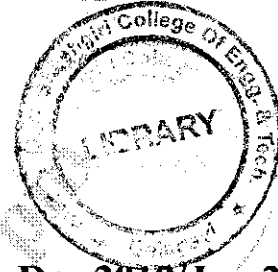
**Module-5**

- 9 a. Explain the production of Ready Mixed concrete. (12 Marks)  
 b. What is Self Compacting Concrete? Explain the materials required for self compacting concrete used. (08 Marks)

**OR**

- 10 a. Explain the types of fibres used in Fiber Reinforced Concrete and its application. (10 Marks)  
 b. Explain properties of light weight concrete. (04 Marks)  
 c. List out advantages of Light weight concrete. (06 Marks)

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17CV45

## Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Basic Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. With the help of 3-phase diagram define: void ratio, porosity, water content and degree of saturation. (08 Marks)
- b. Derive from first principles, the following phase relation:  

$$\gamma_d = \frac{(1 - n_a)G\gamma_w}{1 + WG}$$
 (06 Marks)
- c. With the help of particle size distribution curve explain: well graded soil, uniformly graded soil and gap graded soil. (06 Marks)

OR

- 2 a. With a neat sketch, explain the salient features of a plasticity chart. (08 Marks)
- b. The natural dry density of a soil deposit was found to be 17.5kN/m<sup>3</sup>. A sample of soil was brought to the laboratory and the minimum and maximum dry densities were found as 16kN/m<sup>3</sup> and 19kN/m<sup>3</sup> respectively. Calculate the density index for the soil deposit. (06 Marks)
- c. How many cubic meters of soil can be formed with a void ratio of 0.5 from 100 cubic meters of soil having void ratio of 0.7. (06 Marks)

### Module-2

- 3 a. List and explain various soil structures. (06 Marks)
- b. What is the effect of compaction on soil properties? (06 Marks)
- c. Following are the results of a standard proctor compaction test on a soil:

Water content, %	8.5	12.2	13.75	15.5	18.20
Weight of wet soil in kgs	1.8	1.94	2.0	2.04	2.03

Plot the compaction curve and get maximum dry density and OMC. Also plot ZAV line. Take G = 2.75 and volume of mould as 995 c.c. (08 Marks)

OR

- 4 a. Describe the three principal clay minerals. (08 Marks)
- b. Explain electrical diffuse double layer and adsorbed water. (06 Marks)
- c. What are the factors which affect compaction? (06 Marks)

### Module-3

- 5 a. Derive an expression to obtain coefficient of permeability under falling head condition. (06 Marks)
- b. Explain with a neat sketch the method of locating the phreatic line in a homogeneous earth dam with horizontal filter. (06 Marks)
- c. Calculate the coefficient of permeability of a soil sample, 6 cms in height and 50cm<sup>2</sup> in cross-sectional area, if a quantity of water equal to 430ml passed down in 10 minutes, under an effective constant head of 40cms. On oven drying the test specimen has a mass of 498 gms. Taking the specific gravity of soil solids as 2.65, calculate the seepage velocity of water during the test. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. State the characteristics and uses of flownets. (08 Marks)  
 b. Explain the terms superficial velocity and seepage velocity. Derive the relationship between them. (06 Marks)  
 c. If during a variable head permeability test on a soil sample, equal time intervals are noted for drops of head from  $h_1$  to  $h_2$  and again from  $h_2$  to  $h_3$ . Find the relationship between  $h_1$ ,  $h_2$  and  $h_3$ . (06 Marks)

**Module-4**

- 7 a. Explain mass-spring analogy of consolidation of soils. (06 Marks)  
 b. Explain Casagrande's method of determination of pre consolidation pressure. (06 Marks)  
 c. The time to reach 40% consolidation of a two way drained saturated clay sample of 10mm thick in the laboratory is 40 secs. Determine the time required for 60% consolidation of the same soil 12m thick on an impervious layer subjected to same loading conditions. (08 Marks)

OR

- 8 a. Explain square root of time fitting method for determination of coefficient of consolidation. (06 Marks)  
 b. Explain under consolidated, normally consolidated and over consolidated soils. (06 Marks)  
 c. A layer of clay 8m thick underlies a proposed new building. The existing overburden pressure at the centre of clay layer is  $290\text{kN/m}^2$  and the load due to new building increases the pressure by  $100\text{kN/m}^2$ .  $C_c = 0.45$ ,  $W = 50\%$ ,  $G = 2.71$ . Estimate consolidation settlement. (08 Marks)

**Module-5**

- 9 a. Explain Mohr-Coulomb theory of shear strength. (06 Marks)  
 b. Explain the advantages and disadvantages of direct shear test over triaxial shear test. (06 Marks)  
 c. An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 38mm and was 80mm long. The load at failure measured as 30N and the axial deformation of the sample of failure was 12mm. Determine the unconfined compressive strength and undrained shear strength of clay. (08 Marks)

OR

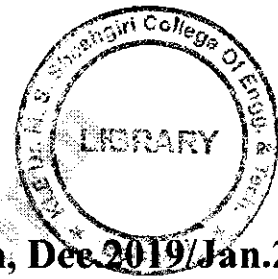
- 10 a. Explain sensitivity and thixotropy. (06 Marks)  
 b. Explain vane shear test with a neat sketch. (06 Marks)  
 c. The triaxial tests carried out on soil samples gave the following results:

Confining pressure, $\text{kN/m}^2$	50	100	150
Deviator stress, $\text{kN/m}^2$	76	132	186
Pore water pressure, $\text{kN/m}^2$	35	59	83

Plot Mohr's circle and obtain effective shear parameters.

(08 Marks)

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17CV46

## Fourth Semester B.E. Degree Examination, Dec 2019/Jan.2020 Advanced Surveying

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. What is the relation between the degree of a curve and its radius? (06 Marks)
- b. What are the requirements of an essential transition curve? (06 Marks)
- c. A reverse curve AB is to be set out between two parallel railway tangents 32m apart. If the two arcs of the curve are to have same radius and the distance between tangents A and B is 160m, calculate the radius. The curve is to be set out from AB at 10m intervals along that line. Calculate the length of offsets. (08 Marks)

**OR**

- 2 a. Explain how a simple circular curve is set out by perpendicular offsets from long chord. (06 Marks)
- b. Explain the features of vertical curves. (04 Marks)
- c. Two straights AC and CB are intersected by a third line MN such that  $\angle CMN = 45^\circ 30'$  and  $\angle CNM = 35^\circ 30'$  and the distance  $MN = 320m$ . Find the radius of the curve which will be tangential to the three lines AC, MN and CB. If the chainage of the intersection point C is 4875.50m, calculate the chainages of the point of curve A and the point of tangency B. (10 Marks)

### Module-2

- 3 a. Explain first order, second order and third order triangulation systems. (06 Marks)
- b. Explain the three kinds of errors. (06 Marks)
- c. From a satellite station S, 5.8m from main triangulation station A, the following directions were observed:

A	$0^\circ$	$0'$	$0''$
B	$132^\circ$	$18'$	$30''$
C	$232^\circ$	$24'$	$6''$
D	$296^\circ$	$6'$	$11''$

The lengths of AB, AC and AD were computed to be 3265.5m, 4022.2m and 3086.4m respectively. Determine the directions of AB, AC and AD. (08 Marks)

**OR**

- 4 a. What are the important factors to be considered in selection of site for a base line? (06 Marks)
- b. Explain Satellite stations and reduction to centre. (06 Marks)
- c. Find the most probable values of the angles A and B from the following observations at a station O. (08 Marks)

A = $9^\circ$	48' 36.6"	Weight 2
B = $54^\circ$	37' 48.3"	Weight 3
A + B = $104^\circ$	26' 28.5"	Weight 4

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. Define the terms, celestial sphere, prime vertical and hour angle. (06 Marks)  
 b. Explain the solution of spherical triangle by Napier's rule. (06 Marks)  
 c. Determine the azimuth and altitude of a star from the following data:  
 Declination of star =  $20^{\circ} 30' N$   
 Hour angle of star =  $42^{\circ} 6'$   
 Latitude of observer =  $50^{\circ} N$  (08 Marks)

**OR**

- 6 a. Mention the properties of a spherical triangle. (06 Marks)  
 b. Calculate the distance in kilometers between two points A and B along the parallel of latitude, given that:  
 i) Lat. of A,  $28^{\circ} 42' N$ ; longitude of A,  $31^{\circ} 12' W$   
 Lat. of B,  $28^{\circ} 42' N$ ; longitude of B,  $47^{\circ} 24' W$   
 ii) Lat. of A  $12^{\circ} 36' S$ ; longitude of A,  $115^{\circ} 6' W$   
 Lat. of B  $12^{\circ} 36' S$ ; longitude of B,  $150^{\circ} 24' E$  (08 Marks)  
 c. The standard time meridian in India is  $82^{\circ} 30' E$ . If the standard time at any instant is 20 hours, 24 min, 6 secs, find the local mean time for a place having  $20^{\circ} E$  longitude. (06 Marks)

**Module-4**

- 7 a. Define: vertical photograph, tilted photograph and oblique photograph. (06 Marks)  
 b. Describe how mosaic differs from a map. (06 Marks)  
 c. A section line AB appears to be 10.16 cms on a photograph for which the focal length is 16cms. The corresponding line measures 2.54 cms on a map which is to a scale of 1:50000. The terrain has an average elevation of 200m above mean sea level. Calculate the flying altitude of the aircraft, above mean sea level when the photograph was taken. (08 Marks)

**OR**

- 8 a. Define: Perspective projection, Nadir point and tilt. (06 Marks)  
 b. List the reasons for keeping overlap in photographs. (06 Marks)  
 c. What is relief displacement? Derive its expression. (08 Marks)

**Module-5**

- 9 a. Mention the advantages of total station and describe its working principle. (10 Marks)  
 b. What is GIS? Mention its applications to Civil Engineering. (10 Marks)

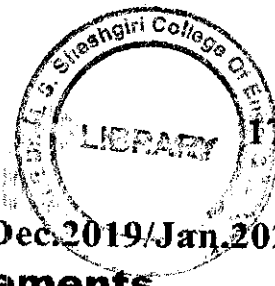
**OR**

- 10 a. Explain the working principle of GPS. What are the differences between hand held GPS and differential GPS? (10 Marks)  
 b. What are the advantages of LIDAR technology? (10 Marks)

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17CV/CT51

**Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Design of RC structural Elements**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, choosing ONE full question from each module.**

**Module-1**

- 1 a. Define characteristic strength of materials and characteristic loads with sketches. (04 Marks)  
 b. Distinguish between : (i) Balanced section, (ii) Under reinforced section and (iii) Over reinforced section with sketches. Which section is preferable and why? (10 Marks)  
 c. Derive an expression for  $\bar{y}$ , the depth of centre of compressive force from the extreme compressive fiber for a singly reinforced rectangular beam section. (06 Marks)

OR

- 2 a. What are the assumption made in the limit state of design for collapse in flexure in singly reinforced beam section. (04 Marks)  
 b. A simply supported beam has a rectangular section of size 300mm × 650mm and carries a uniformly distributed load of 15 kN/m over a clear span of 5.5 m. It is reinforced with 4 bars of 25 mm diameter bar. Use M25 concrete and Fe 500 grade HYSD bars. Compute short and long term deflections of the beam. (16 Marks)

**Module-2**

- 3 a. A reinforced concrete Cantilever beam 2 m long and having cross section of size 240mm × 400mm is reinforced with 4 bars of 16 mm diameter at top on tension side. The beam is designed to support a concentrated load of 3 kN at the free end in addition to uniformly distributed load on it. Determine the permissible uniformly distributed load, the beam can carry on it. Use M20 grade concrete and Fe 415 grade steel. (10 Marks)  
 b. A doubly reinforced beam section is 300 mm wide and 500 mm deep to the centre of tensile reinforcement. It is reinforced with compression reinforcement of 300 mm<sup>2</sup> at an effective cover of 50 mm and tension reinforcement of 1800 mm<sup>2</sup>. Determine the safe moment of resistance of the section. M20 grade concrete and Fe 500 grade steel is used. (10 Marks)

OR

- 4 a. A singly reinforced concrete slab 150 mm thick is reinforced with 10 mm diameter bars at 200 mm centres located at an effective depth of 125 mm. M20 grade concrete and Fe415 grade HYSD bars are used. Estimate the ultimate moment of resistance of the section. (04 Marks)  
 b. A rectangular RC section of size 300 × 600mm effective is reinforced with 4 bars of 25 mm diameter HYSD bar of grade Fe 415. Two of the tension bars are bent at 45° near the support section. The beam is provided with double legged vertical links of 8 mm diameter at 150 mm centres near supports. Using M-25 grade concrete, compute the ultimate shear strength of the support section. (08 Marks)  
 c. A simply supported T-beam of depth of 450 mm has a flange width of 1000 mm and depth of 120 mm. It is reinforced with 6 – 20 mm diameter bars on tension side with a clear cover of 30 mm. M20 grade concrete and Fe415 grade steel are used. Calculate moment of resistance of beam. Take,  $b_c = 300$  mm. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. Design a singly reinforced beam simply supported at its two ends for flexural reinforcement. The clear span of beam is 5.6 m, the intensity of uniformly distributed superimposed dead and live loads are 18 kN/m and 26 kN/m. Use M-25 grade of concrete and HYSD steel of Fe500 grade. The beam should meet the durability requirement for exposed conditions of 'Severe' atmospheric and fire resistance of one and half hour. (08 Marks)
- b. Design a doubly reinforced rectangular beam of size 300mm × 600mm simply supported at both ends. Check for deflection need not be calculated. The effective span is 5.6 m. The beam carries a service imposed load of 24 kN/m and super imposed dead load of 16 kN/m. Use M20 grade of concrete and HYSD steel of Fe415 grade. (12 Marks)

**OR**

- 6 Design an intermediate T-beam for a hall measuring 6.5m × 12m (clear dimensions). Beams are spaced at 3 m C/C. Depth of slab is 150 mm. Super imposed live load on slab is 4.0 kN/m<sup>2</sup>, finishes is 1.0 kN/m<sup>2</sup>. Check for deflection also. Use M20 grade concrete and HYSD bar of Fe500 grade. Sketch the reinforcement details. (20 Marks)

**Module-4**

- 7 Design a slab for a class room of dimension 4m × 6m (supported on all the four edges) with two adjacent edges discontinuous. Live load = 3 kN/m<sup>2</sup>, Floor finish = 1 kN/m<sup>2</sup>; Bearing = 300 mm. Use M20 grade concrete and Fe500 grade steel. Check for deflection need not be done. (20 Marks)

**OR**

- 8 Design the two flight dog legged stair for a hall of dimension (clear) 3m × 5m between the floors. The floor to floor height is 3.2 m and rise is 160 mm. Also check for deflection. Use M20 grade concrete and Fe500 grade steel. Sketch the reinforcement details of one flight. (20 Marks)

**Module-5**

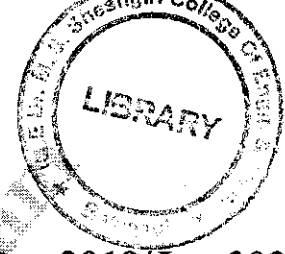
- 9 a. Design the necessary reinforcement for RC column 450mm × 600mm to carry an axial load of 2000 kN. The length of the column is 3.5 m. Use M25 grade concrete and Fe415 grade steel. Sketch the reinforcement details. (10 Marks)
- b. A rectangular column 300 mm wide and 500 mm deep is subjected to an axial factored load of 1200 kN and a factored moment of 200 kN-m. Calculate the necessary reinforcement distributing equally on all four sides. Sketch the reinforcement details. Adopt M25 and Fe500 grade materials. (10 Marks)

**OR**

- 10 Design a square footing of flat type for a column of size 400mm × 400mm to carry an axial dead load of 800 kN and a live load of 1000 kN without any moment. Safe bearing capacity of soil is 180 kN/m<sup>2</sup>. Adopt M20 grade concrete and Fe 500 grade steel. Sketch the footing showing the details of reinforcement. (20 Marks)

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17CV52

## Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Analysis of Indeterminate Structures

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 Analyse the beam completely by slope deflection method relative to support A support B sinks by 1mm and support C rises by 0.5 mm. Take  $EI = 30000 \text{ kN-m}^2$ . Refer Fig.Q1. Draw BMD, SFD and Elastic curve.

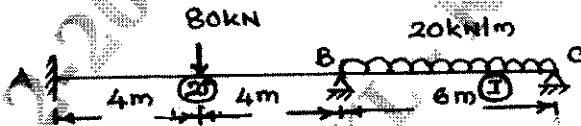


Fig.Q1

(20 Marks)

OR

- 2 Analyse the given frame by slope deflection method. Draw SFD, BMD and elastic curve. Refer Fig.Q2.

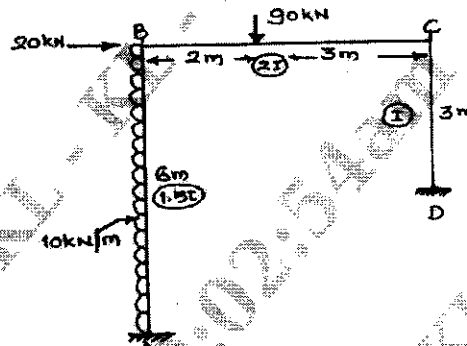


Fig.Q2

(20 Marks)

### Module-2

- 3 Analyse the beam shown in Fig.Q3 by moment distribution method. Draw BMD, SFD and elastic curve.

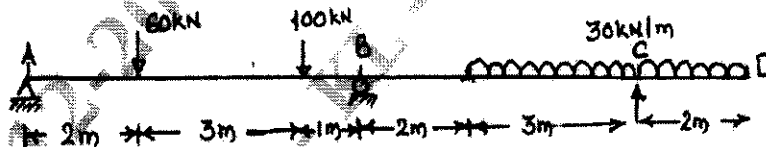


Fig.Q3

(20 Marks)

OR

- 4 Analyse the frame by moment distribution method. Draw BMD, SFD and elastic curve. Refer Fig.Q4.

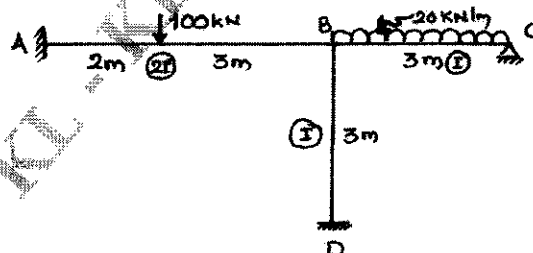


Fig.Q4

(20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 Analyse the three span continuous beam shown in Fig.Q5 by using Kani's method. Draw BMD, SFD and elastic curve.

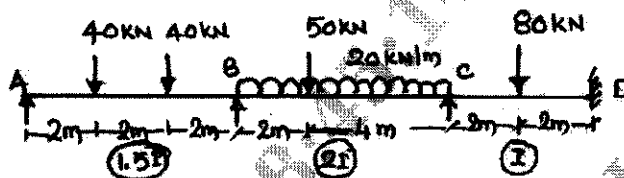


Fig.Q5

(20 Marks)

OR

- 6 Analyse the portal frames shown in Fig.Q6 by using Kani's method. Draw BMD, SFD and elastic curve.

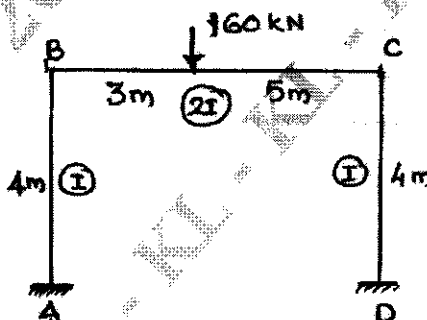


Fig.Q6

(20 Marks)

**Module-4**

- 7 Analyse the continuous beam shown in Fig.Q7 by flexibility method using system approach. Support B sinks by 5 mm sketch BMD, SFD and elastic curve. Take  $EI = 15 \times 10^3 \text{ kN-m}^2$ .

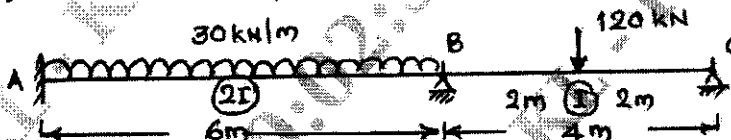


Fig.Q7

(20 Marks)

OR

- 8 Analyse the pin jointed plane truss shown in Fig.Q8 by using flexibility matrix method. Assume  $\frac{L}{AE}$  for each member = 0.025 mm/kN. Tabulate the member forces.

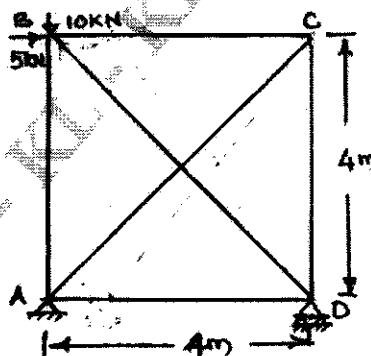
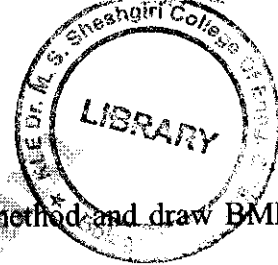


Fig.Q8

(20 Marks)



**Module-5**

- 9 Analyse the frame shown in Fig.Q9 by stiffness matrix method and draw BMD, SFD and Elastic curve. Assume EI is constant throughout.

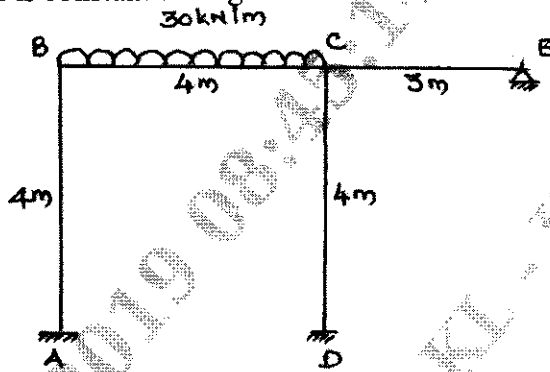


Fig.Q9

(20 Marks)

OR

- 10 Analyse the continuous beam shown in Fig.Q10 by using stiffness matrix method.

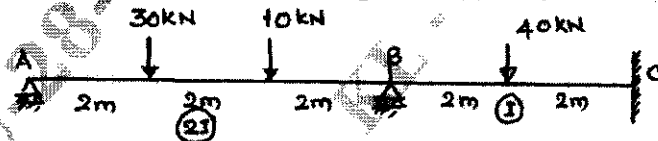
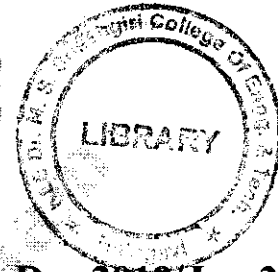


Fig.Q10

(20 Marks)

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17CV53

## Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Applied Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS:6403 permitted.

### Module-1

- 1 a. What are the objectives of soil exploration? (06 Marks)
- b. With a neat sketch, explain seismic refraction method of soil exploration. (08 Marks)
- c. What is the necessity of dewatering? Explain electro-Osmosis method of dewatering. (06 Marks)

OR

- 2 a. Define the following terms with reference to a sampling tube with a neat sketch:
  - i) Inside clearance
  - ii) Outside clearance
  - iii) Area ratio
  - iv) Recovery ratio. (08 Marks)
- b. What is stabilization of bore holes? Explain any one method. (06 Marks)
- c. List and explain types of soil samples. (06 Marks)

### Module-2

- 3 a. Derive the equation for vertical stress below the centre of a circular area with uniform load intensity 'q'. (08 Marks)
- b. Define Isobar. Construct an Isobar for a vertical stress of  $40\text{kN/m}^2$ , when ground surface is subjected to a concentrated load of  $1000\text{kN}$ . (08 Marks)
- c. Estimate the immediate settlement of a footing of size  $2\text{m} \times 3\text{m}$  resting at a depth of  $2\text{m}$  in a sandy soil whose compression modulus is  $10\text{N/mm}^2$  and the footing is expected to transmit a unit pressure of  $160\text{kN/m}^2$ . Assume  $\mu = 0.28$  and  $I_f = 1.06$ . (04 Marks)

OR

- 4 a. Explain the construction and use of Newmark's chart. (08 Marks)
- b. Explain contact pressure distribution in soils. (06 Marks)
- c. A square footing  $1.2\text{m} \times 1.2\text{m}$  rests on a saturated clay layer  $4\text{m}$  deep. The soil properties are  $W_L = 30\%$ ,  $\gamma_{\text{sat}} = 17.8\text{kN/m}^3$ ,  $w = 28\%$  and  $G = 2.68$ . Determine primary consolidation settlement if the footing carries a load of  $300\text{kN}$ . (06 Marks)

### Module-3

- 5 a. Define with neat sketches at rest, active and passive earth pressures. (06 Marks)
- b. Explain Culmann's graphical method of finding out the active earth pressure. (06 Marks)
- c. A retaining wall retains a cohesionless backfill with a height of  $7.5\text{m}$ . The top  $3\text{m}$  of the backfill has unit weight of  $18\text{kN/Nm}^3$  and  $\phi = 30^\circ$ . Lower  $4.5\text{m}$  of the backfill has unit weight of  $24\text{kN/m}^3$  and  $\phi = 20^\circ$ . Obtain pressure distribution diagram and determine the total active pressure and its point of application. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg,  $42+8 = 50$ , will be treated as malpractice.

OR

- 6 a. Explain Fellinius method of obtaining centre of critical slip surface in the case of stability analysis of C- $\phi$  soil. (08 Marks)
- b. Explain the causes for slope failure and also list the type of slope failures. (06 Marks)
- c. A 5m deep canal has side slopes of 1:1. The properties of soil are  $C_u = 20 \text{ kN/m}^2$ ,  $\phi_u = 10^\circ$ ,  $e = 0.80$  and  $G = 2.8$ . If Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion when the canal runs full. Also find the factor of safety in case of sudden draw down, if the Taylor's stability number for this condition is 0.137. (06 Marks)

**Module-4**

- 7 a. Define: Ultimate bearing capacity, net ultimate bearing capacity and safe bearing capacity. (06 Marks)
- b. Explain plate load test with a neat sketch. (08 Marks)
- c. A foundation 2.0m square is installed 1.2m below ground level in sandy soil having unit weight of  $19.2 \text{ kN/m}^2$  above water table and submerged unit weight of  $10.1 \text{ kN/m}^3$ . If  $C = 0$ , and  $\phi = 30^\circ$ , find ultimate bearing capacity when
- Water table is well below the base of the foundation,
  - Water table rises to foundation level,
  - Water table rises to ground level.
- Take  $N_q = 22$  and  $N_r = 20$ . (06 Marks)

OR

- 8 a. Distinguish between general shear failure and local shear failure. (06 Marks)
- b. Explain with a neat sketch the effect of ground water table and eccentricity on bearing capacity. (08 Marks)
- c. How do you conduct SPT? What are the corrections applied to observed 'N' values? (06 Marks)

**Module-5**

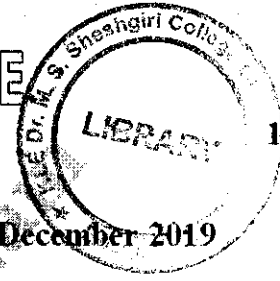
- 9 a. Explain classification of piles based on function. (06 Marks)
- b. Explain negative skin friction in pile foundation. (06 Marks)
- c. Design a square pile group to carry 400kN of load in clay with an unconfined compressive strength of  $60 \text{ kN/m}^2$ . The piles are 30cms diameter and 6m long. Adhesion factor may be taken as 0.6. (08 Marks)

OR

- 10 Write short notes on any four of the following:
- Pile load test
  - Under reamed piles
  - Settlement of piles
  - Efficiency of pile group
  - Group capacity of piles.
- (20 Marks)

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Fifth Semester B.E. Degree Examination, December 2019  
(CIVIL ENGINEERING)

**COMPUTER AIDED BUILDING PLANNING AND DRAWING**

Time: 3 Hours

Max. Marks: 100

- Note: 1. Answer any *TWO* full questions as per INTERNAL CHOICE.  
2. Assume any missing data suitably.

**Q1.** Draw plan and sectional elevation of an open newel stair with a rectangular well for an office building with the following data:

Inside dimensions of staircase = 4.5m x 5.4m.

Height between the floors is 3.6m

Thickness of the floor slab and landing slab is 150mm.

Width of landing = 1.5m

Width of stair = 1.5m.

Tread = 300mm, riser = 150mm.

Waist slab thickness = 150mm.

Reinforcement details: Main steel:  $12\phi @ 150$  c/c spacing and Distribution:  $8\phi @ 250$  c/c spacing. (40 Marks)

OR

**Q2.** Draw cross section and plan of one way roof slab showing the details of reinforcement for the following data:

Clear span = 4m

Length of slab = 10m

Thickness of slab = 130mm

Bearing wall = 200mm

Main reinforcement:  $12\phi @ 250$  c/c with alternate bars bent up.

Distribution reinforcement:  $8\phi @ 200$  c/c. (40 Marks)

**Q3.** The line diagram of a residential building is given in Fig Q3. Draw to scale the following. Given main wall 230 mm thick, partition wall = 100 mm, floor height = 3.0 m

- Plan at sill.
- Front Elevation.
- Section along A-A.
- Schedule of openings.

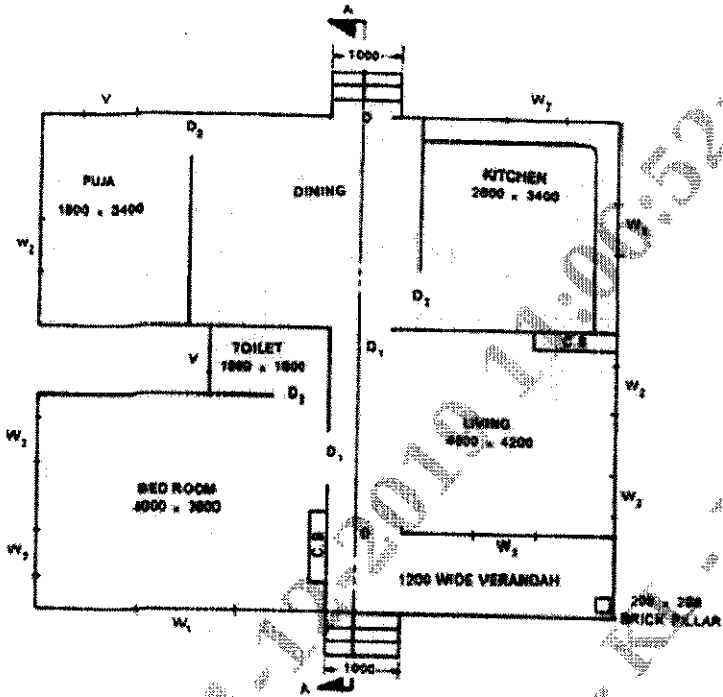
(60 Marks)

OR

**Q4.** The line diagram of a School building is given in Fig Q4. Draw to scale the following.

- Plan at sill.
- Front Elevation.
- Section along A-A.
- Schedule of openings.

(60 Marks)



SCHEDULE	
D	= 1 X 2.1 m
D1	= 1 X 2.0 m
D2	= 0.9 X 1.8 m
W1	= 1.5 X 1.2 m
W2	= 1 X 1.2 m
CB	= 1.5 X 1.8m
V	= 1 X 0.6 m

Fig Q3

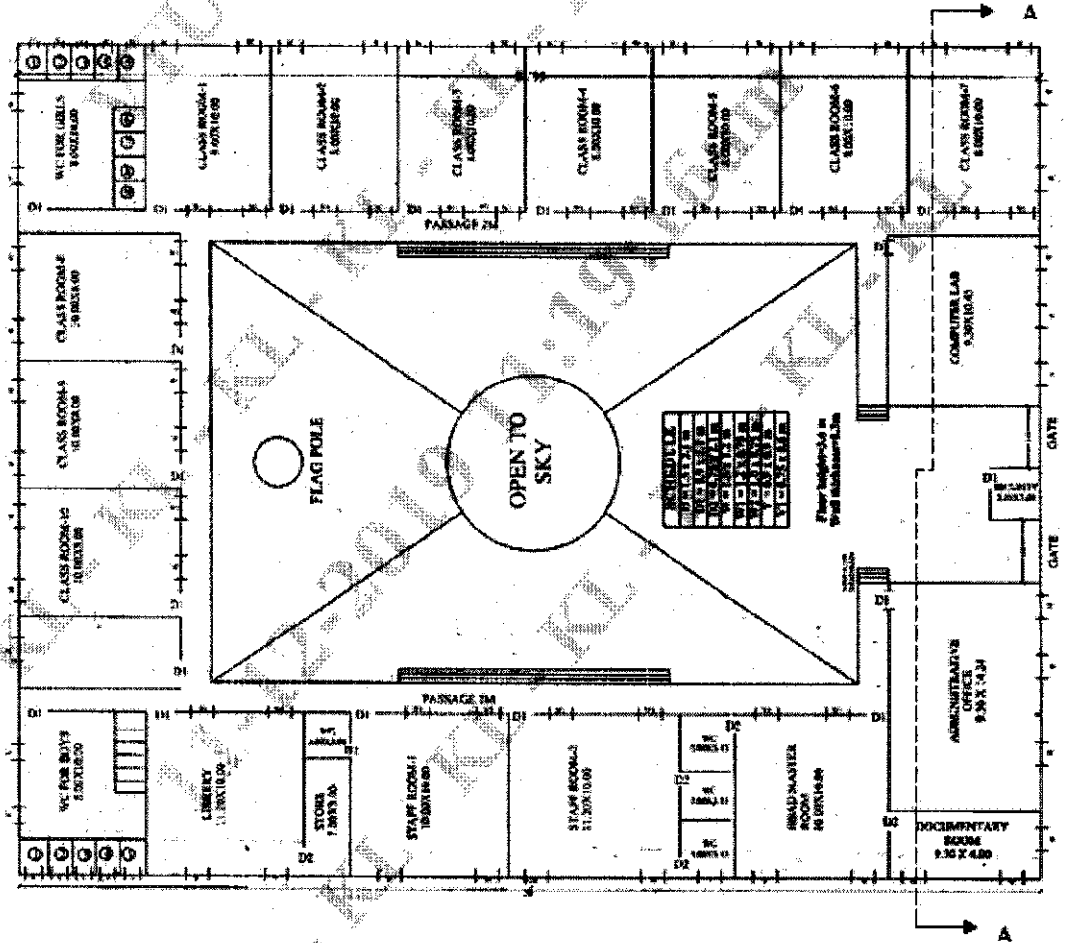
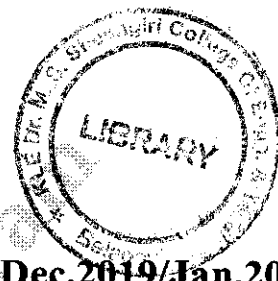


Fig Q4





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17CV552

## Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Railways, Harbour, Tunneling and Airports

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Explain the types of track stress. (06 Marks)
- b. What are the functions and requirements of sleepers? (06 Marks)
- c. Discuss the conventional method of route alignment surveys. (08 Marks)

OR

- 2 a. Discuss the significance of road, rail, water and air transport. (06 Marks)
- b. List the requirements and explain the types of rails. (06 Marks)
- c. Determine the super elevation to be provided for a  $2.5^\circ$  transition curve having a maximum sectional speed of 100 kmph for a broad gauge track. (08 Marks)

### Module-2

- 3 a. Discuss the stabilization methods of track on poor soil. (06 Marks)
- b. Demonstrate the modern methods of track maintenance. (08 Marks)
- c. Explain the classification of railway stations. (06 Marks)

OR

- 4 a. Mention the passenger amenities to be provided in the railway station. (06 Marks)
- b. Explain the types of yards. (06 Marks)
- c. Outline the quantity of materials required to construct 1.2 km long BG track.  
Take sleeper density =  $(m+4)$ , Length of Rail = 13 m (08 Marks)

### Module-3

- 5 a. List the requirements of harbor. (06 Marks)
- b. Describe the components of harbor with neat sketch. (08 Marks)
- c. Define sea wave. Explain the types of sea waves. (06 Marks)

1 of 2

OR

- 6 a. Write a note on tunnel drainage and tunnel lining. (08 Marks)  
 b. Explain the shapes of tunnels with sketch. (06 Marks)  
 c. Write a neat sketch, explain the linear plate method of tunneling. (06 Marks)

**Module-4**

- 7 a. Discuss the component parts of airport. (08 Marks)  
 b. Explain the characteristics of air transport. (04 Marks)  
 c. Explain the aircraft characteristics which affect the airport design. (08 Marks)

OR

- 8 a. Mention the objectives of airport planning. (05 Marks)  
 b. Sketch the typical airports showing different runways. (08 Marks)  
 c. Write a note on parking and circulation area. (07 Marks)

**Module-5**

- 9 a. Define orientation of runway. Explain the procedure of plotting Type-I wind rose diagram. (07 Marks)  
 b. Describe the elements of runway geometric design. (07 Marks)  
 c. Write a note on airport turning zone. (06 Marks)

OR

- 10 a. Explain the different types of lightings used in airport. (06 Marks)  
 b. Explain the passenger facilities and services available at airport. (06 Marks)  
 c. Calculate the actual length of runway from the following data:  
 (i) Airport elevation : R.L 1003  
 (ii) Airport reference temperature : 28°  
 (iii) Basic runway length : 600 m  
 (iv) Highest point along the length : R.L.98.2  
 (v) Lowest point along the length : R.L.95.2 (08 Marks)

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17CV553

## Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Masonry Structures

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS1905-1987 is permitted.**

### Module-1

- List the various ingredients of good brick earth. Explain their characteristics on the brick quality. (10 Marks)
  - What are the various engineering properties of masonry that needs to be evaluated to be called as a good masonry unit? Indicating the codal limits for the same, explain any one test in detail. (10 Marks)

OR

- What are the various factors that affect the strength of masonry? Explain them. (10 Marks)
  - "Masonry tends to undergo cracking due to various reasons". List them. Sketch the pattern of cracks observed in it. (10 Marks)

### Module-2

- Define effective height of walls as per IS1905-1987. Indicate its values for different cases with sketches. (10 Marks)
  - Explain the classification of masonry walls with the help of flowchart. Briefly explain any of them with sketch. (10 Marks)

OR

- A solid wall of thickness 150 mm is constructed with solid concrete blocks of unit strength 5 MPa and "M<sub>2</sub>" type mortar. The floor to floor height is 3.2m. The load is acting axially on the wall. Determine:
    - Effective thickness, effective height
    - Slenderness ratio
    - Stress modification factor and permissible stress in masonry (10 Marks)
  - What is slenderness ratio with respect to masonry walls? How does it have an impact on strength of masonry? Indicate the limits specified in IS1905-1987 for masonry walls, columns. (10 Marks)

### Module-3

- Design an interior wall cross wall of a 2-storeyed load bearing masonry building to carry 125 mm thick RCC slab with 3.2 m ceiling height. The wall is stiffened and it supports a 2.8 m wide slab. Given the following details:  
LL on roof = 1.5 kN/m<sup>2</sup>  
LL on floor = 2 kN/m<sup>2</sup>  
Weight of 100 mm thick WPC = 2 kN/m<sup>2</sup>  
Weight of floor finish = 1 kN/m<sup>2</sup>  
Note, the masonry unit strength available is 10 MPa concrete blocks of 150 mm size. (20 Marks)

OR

- 6 Design an interior wall of a single storeyed workshop of height 5.4 m supporting a RCC roof. The bottom of wall rests over a foundation block. Take the roof load = 45 kN/m. Provide pier of suitable size as per codal provisions. The spacing between pier can be taken as 3.6 m c/c. (20 Marks)

**Module-4**

- 7 Design an interior cavity wall of a three storeyed building ceiling height of each storey being 3m. The wall is stiffened by intersecting walls 200 mm thick at 3.6 m c/c. Take loading from roof = 16 kN/m and loading from floor = 12.5 kN/m. [Refer Fig.Q7]

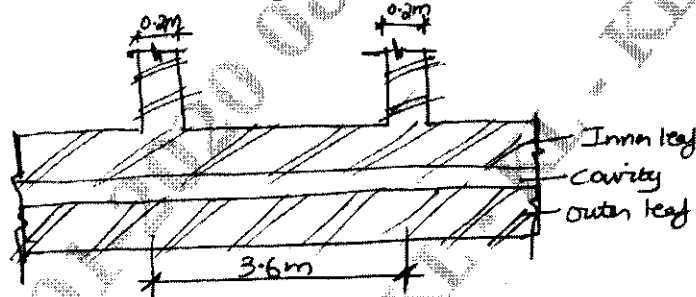


Fig.Q7

(20 Marks)

OR

- 8 Design an external wall of a single storeyed building, the inner leaf of which supports an eccentric load of 7 kN/m at an eccentricity of 25 mm. The wall is an unstiffened one which supports a concrete roof at the top and rests over a foundation block. Height of wall is 4m. [Refer Fig.Q8]

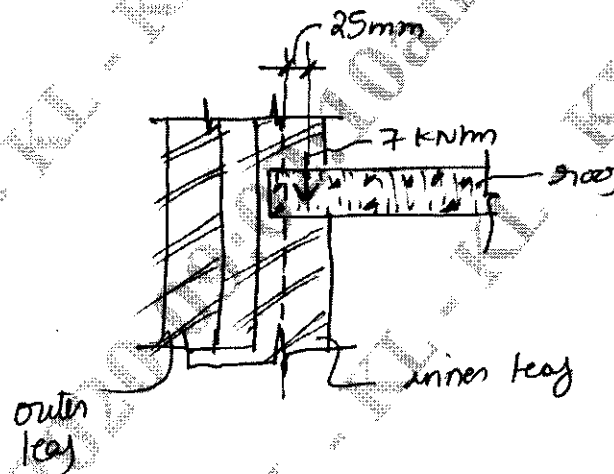


Fig.Q8

(20 Marks)

**Module-5**

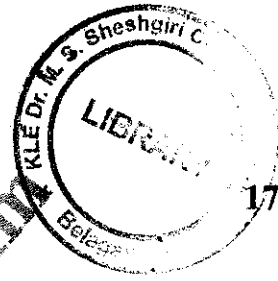
- 9 Design an exterior wall of a single storey warehouse of 3.5m height. The loading on the wall consists of vertical loading of 25 kN/m from roof and wind pressure of 860 kN/m<sup>2</sup>. The wall is tied with metal anchor at floor and roof levels. (20 Marks)

OR

- 10 a. What are the different modes of failure in masonry infilled RC frames? Explain them with sketch. (12 Marks)  
 b. What are the various F.O.S stability checks that have to be checked during design of masonry retaining walls? Indicate their limits. (08 Marks)

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2 of 2



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17CV561

## Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Traffic Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Define traffic engineering and explain its scope. (10 Marks)  
b. Explain the different resistances to be considered in vehicle movement. (10 Marks)

OR

- 2 a. In detail explain the road user characteristics. (10 Marks)  
b. A vehicle of mass 1800 kg has to accelerate at  $2 \text{ m/sec}^2$  from a speed of 12 KMPH to 22 KMPH in the first gear. The gradient is +1.2% and the co-efficient of rolling resistance is 0.025. The frontal area and co-efficient of air resistance are  $2.38 \text{ m}^2$  and 0.37 respectively. Determine the engine horse power required. (10 Marks)

### Module-2

- 3 a. List the objectives and uses of,  
(i) Origin and destination studies.  
(ii) Parking studies. (10 Marks)  
b. Discuss the various traffic studies and what are the objects of carrying out traffic volume studies? (10 Marks)

OR

- 4 a. Write the objectives of accident studies, also mention the various causes of accidents. (10 Marks)  
b. A vehicle of weight 2.0 tonnes skids through a distance equal to 40 m before colliding with another parked vehicle of weight 1.0 tonne, after equal to 12 m before stopping. Compare the initial speed of the moving vehicle. Assume co-efficient of friction as 0.5. (10 Marks)

### Module-3

- 5 a. Explain the following with examples,  
(i) Regulatory signs.  
(ii) Warning signs.  
(iii) Informative signs. (10 Marks)  
b. Briefly explain a grade and grade separated inter section. (10 Marks)

OR

- 6 a. List the advantages and disadvantages of traffic signals. (10 Marks)  
b. The average normal flow on cross roads 'A' and 'B' during design period are 400 PCU and 250 PCU per hour. The saturation flows are 1250 PCU and 1000 PCU per hour respectively. The all red time required for pedestrian crossing is 12 seconds. Design a two phase signal by Webster's method. (10 Marks)

### Module-4

- 7 a. Explain various design factors of road lighting. (10 Marks)  
b. Discuss the effect of air pollutants. (10 Marks)

OR

- 8 a. Explain the measures to control the traffic noise. (10 Marks)  
b. Write short notes on road safety audit. (10 Marks)

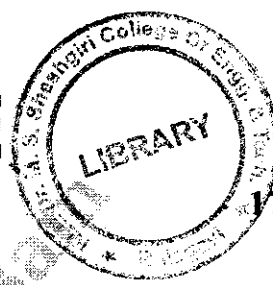
Module-5

- 9 a. Explain (i) TSM (Traffic System Management) (10 Marks)  
(ii) TDM (Traffic Demand Management) (10 Marks)  
b. What are the applications of ITS?

OR

- 10 a. Enumerate the basic principles of traffic regulation. (10 Marks)  
b. Explain the factors determining skid resistance. (10 Marks)

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17CV/CT563

**Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020**

## **Remote Sensing and GIS**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. With a neat sketch, explain the process of remote sensing. (10 Marks)  
b. Briefly explain how energy interactions with earth features, i.e. soil and vegetation occurs in remote sensing. (10 Marks)

**OR**

- 2 a. What is visual interpretation technique? List and explain in brief the elements of visual interpretation techniques. (10 Marks)  
b. With neat sketch, explain the electromagnetic spectrum with its wavelengths. (10 Marks)

### Module-2

- 3 a. Briefly explain IRS and Landsat satellites with their series and characteristics. (10 Marks)  
b. Define resolution and explain the types of resolutions. (10 Marks)

**OR**

- 4 a. What are the types of errors in remote sensing? Explain them briefly. (10 Marks)  
b. Explain in detail the image enhancements and image filtering techniques used in remote sensing. (10 Marks)

### Module-3

- 5 a. What are the components of GIS? Explain in brief the various components. (10 Marks)  
b. Explain the process of joining spatial and attribute data in GIS. (10 Marks)

**OR**

- 6 a. With figure, explain the UTM zones used in GIS. (10 Marks)  
b. What are map projections? Explain the various map projection methods in brief. (10 Marks)

### Module-4

- 7 a. Explain briefly the representation of various features in raster data structures. (10 Marks)  
b. Explain the comparison of raster data and vector data models with traditional advantages and disadvantages. (10 Marks)

**OR**

- 8 a. List and explain the different types of raster data models. (10 Marks)  
b. Define topology and explain its importance in GIS with advantages and disadvantages. (10 Marks)

### Module-5

- 9 a. Briefly explain the importance of integration of remote sensing and GIS. (10 Marks)  
b. Explain the application of remote sensing in traffic management. (10 Marks)

**OR**

- 10 a. What are the applications of remote sensing in land use / land cover analysis? Briefly explain. (10 Marks)  
b. Explain the application of remote sensing and GIS in environmental and urban planning. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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## Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Occupational Health and Safety

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Outline the history and development of OSHA. (07 Marks)  
b. Write a brief note on National Safety Policy. (06 Marks)  
c. Write a note on Right - to - know laws as a result of SARA - III. (07 Marks)

OR

- 2 a. Explain the causation/causes of accident in industry. (08 Marks)  
b. Outline the process of accident investigation at a workplace. (12 Marks)

### Module-2

- 3 a. What is Ergonomics? Discuss the factors considered by ergonomics to prevent hazard at workplace. (08 Marks)  
b. Write short notes on any 3 of the following :  
(i) Ergonomic standards (ii) Ergonomic programs (iii) Work space envelope  
(iv) Visual Ergonomics. (12 Marks)

OR

- 4 a. Discuss the application of fault tree analysis method with an example. (10 Marks)  
b. Explain the process of emergency response plan and decision for action. (10 Marks)

### Module-3

- 5 a. Define Fire and explain various types of fire. (08 Marks)  
b. What are fire extinguishers? List various fire extinguish techniques and explain any two of them with a neat sketch. (12 Marks)

OR

- 6 a. Define Product Safety. Give the technical requirements of product safety. (10 Marks)  
b. Write short note on any 3 of the following :  
(i) Fire development and its severity  
(ii) Effects of enclosure  
(iii) Early detection of fire  
(iv) Electrical safety. (10 Marks)

### Module-4

- 7 a. State various modes of transmission of diseases at workplace. Recommend preventive methods for them. (10 Marks)  
b. Discuss the effects of exposure to solid waste. (10 Marks)

OR

- 8 a. Write a note on use of personal protective equipments for health and safety considerations. (10 Marks)
- b. What is Environment at Management Plan (EMP)? Explain the process of EMP for any given project. (10 Marks)

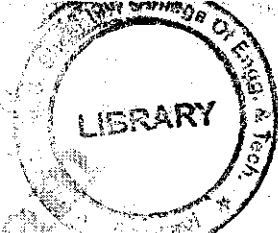
**Module-5**

- 9 a. Illustrate the health and safety considerations to be followed in water and wastewater treatment plant. (12 Marks)
- b. Discuss the handling of chemicals in laboratory. (08 Marks)

OR

- 10 Discuss the Health and Safety considerations to be following in any two of the following: (20 Marks)
- a. Cement Industry
  - b. RMC Plants
  - c. Precast Plants
  - d. Construction sites

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15CV61

## Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Construction Management and Entrepreneurship

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. What are the characteristics of management? (08 Marks)
- b. What are the functions of management? (08 Marks)

OR

- 2 a. Define : i) Duration ii) Earliest start time iii) Earliest finish Time iv) Total float. (08 Marks)
- b. Draw the network from the following activity and find critical path and total project duration Ref to table 1.

Activity	Predecessors	Duration (days)
A	-	10
B	-	9
C	A	9
D	A	8
E	B	7
F	B	11
G	D, E	5

(08 Marks)

### Module-2

- 3 a. What are the factors affecting the labour output or productivity? (08 Marks)
- b. Explain the basic concepts of Resource management. (08 Marks)

OR

- 4 a. Explain the classification of construction equipment. (08 Marks)
- b. Explain the sketch excavator. (08 Marks)

### Module-3

- 5 a. Explain the processes of project quality management. (08 Marks)
- b. Explain TQM. (08 Marks)

OR

- 6 a. What are the safety precautions to prevent accidents? (08 Marks)
- b. Explain workmen compensation Act and Indian factories Act. (08 Marks)

### Module-4

- 7 a. What are the principles of engineering economy? (08 Marks)
- b. Explain Time value of money. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. Write the Assumptions made in Break Even Analysis. What are the uses of Break Even Analysis? (08 Marks)  
b. Explain Break Even Chart. (08 Marks)

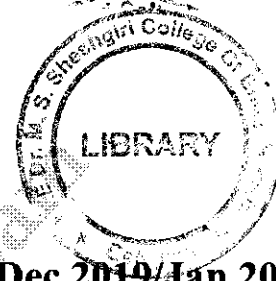
**Module-5**

- 9 a. What are the functions of an Entrepreneur? (08 Marks)  
b. What are the stages in Entrepreneurial process? (08 Marks)

OR

- 10 a. What are the advantages and disadvantages of becoming an entrepreneur? (08 Marks)  
b. Discuss on MSME. (08 Marks)

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15CV62

## Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Design of Steel Structural Elements

Time: 3 hrs.

Max. Marks: 80

**Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS800-2007 and steel tables are allowed.

### Module-1

- 1 a. Explain the advantages and disadvantages of steel structure. (08 Marks)
- b. Distinguish between Working stress design and Limit state design of steel structure. (08 Marks)

OR

- 2 a. Calculate the "Shape factor" for the Triangular section. (06 Marks)
- b. Analyse the continuous beam "ABC" subjected to working loads show in Fig.Q2(b) and determine the plastic moment. Use load factor is 1.5. (10 Marks)



Fig.Q2(b)

### Module-2

- 3 a. Explain with neat sketches of various 'Mode of failure' of bolts connection? (06 Marks)
- b. Determine the "bolt value" for a bolt M16 and property class 4.6. Used to connect lap joint as shown in Fig.Q3(b). Take ultimate Tensile Strength of plate 410 MPa. (10 Marks)

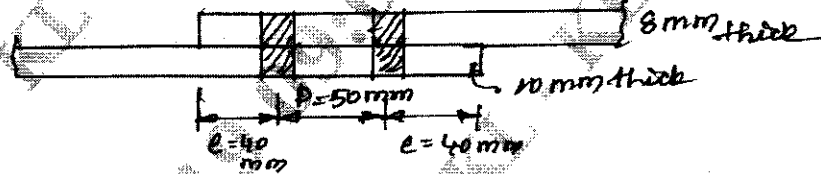


Fig.Q3(b)

OR

- 4 a. What are the advantages and disadvantages of welded connection? (06 Marks)
- b. Determine the bracket load that can resisted by the bracket shown in Fig.Q4(b) by fillet weld of size 8mm. (10 Marks)

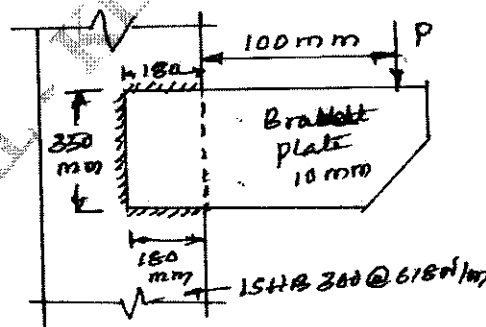


Fig.Q4(b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. Explain the behavior of compression member. (06 Marks)  
 b. Determine the compressive strength of a strut of ISA 150×75×8 mm connected to a gusset plate when (i) with one bolt (ii) with more than two bolts (iii) Welded. Assume angle is axially loaded. Take length of the member is 3m. (10 Marks)

**OR**

- 6 Design a column section using double channels back to back to carry a factored load of 2000 kN. The height of the column is 5m with the column is hinged at both ends. Also design the column with lacing with bolted connection. (16 Marks)

**Module-4**

- 7 a. What is Lug Angle/ Explain in brief with a neat diagram. (04 Marks)  
 b. Determine the tensile strength of a plate 160mm × 10mm connected with bolts of M18 in two lines. (12 Marks)

**OR**

- 8 Compression member ISHB 300@ 63 kg/m is carrying a load of 800 kN. Take M20 grade of concrete and 150 kN/m<sup>2</sup> SBC of soil. Design slab base and concrete base using welded or bolted connection. (16 Marks)

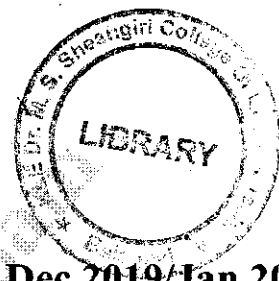
**Module-5**

- 9 a. What are the factors, which affects lateral stability? (04 Marks)  
 b. Determine the design bending strength of a beam ISMB 300@ 434 N/m. Assume that the factored shear force is less than the design shear strength. Use Fe-410 grade of steel. (12 Marks)

**OR**

- 10 Design a suitable beam for a roof of dimension 7.5m × 12m consists of 100mm thick R.C. slab supported on steel beams spaced at 3m centre to centre. The floor finishing may be taken as 1 kN/m<sup>2</sup> and live load is 4 kN/m<sup>2</sup>. The self weight of beam is assumed as 1 kN/m<sup>2</sup>. Take limiting deflection as span/250. (16 Marks)

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## Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Highway Engineering

Time: 3 hrs.

Max. Marks: 80

**Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Assume any missing data suitably.

### Module-1

- 1 a. Explain the various characteristics of Road Transport. (04 Marks)
- b. What are the objectives of IRC and Central Road Research Institute [CRRI] (08 Marks)
- c. What are the advantages and disadvantages of airways? (04 Marks)

OR

- 2 a. Explain the saturation system of Road Planning. (04 Marks)
- b. Write a short note on KSHIP and its projects. (04 Marks)
- c. Four new road links A, B, C & D are to be constructed during a 5 year plan period. Suggest the order of priority for phasing the road construction programme based on maximum utility approach. Assume utility units of 0.5, 1.0, 2.0 and 4.0 for the population ranges and 2, 2 and 5 units per 1000 tonnes of agricultural, raw material and industrial products from the following data:

Road link	Length km	No. of villages with Pop <sup>n</sup> range				Productivity served		
		<500	501-1000	1001-2000	>2000	Agricultural	Raw materials	Industrial Product
A	75	30	15	10	3	8000	3000	1000
B	35	20	08	06	3	5000	1000	1600
C	40	15	06	05	5	6000	2000	3200
D	50	40	04	03	2	3000	7000	500

(08 Marks)

### Module-2

- 3 a. What are the main objectives of preliminary survey and steps followed in the preliminary survey by conventional method [Name the steps]. (06 Marks)
- b. Briefly explain the map study is the alignment of a highway project. (04 Marks)
- c. Define camber. Discuss the factors on which the amount of camber to be provided depends. Specify, the recommended ranges of camber for different types of pavement surfaces. (06 Marks)

OR

- 4 a. Explain the PIEV theory with a neat diagram. (06 Marks)
- b. Calculate the minimum sight distance required to avoid a head on collision of two cars approaching from the opposite directions at 90 and 60 kmph. Assume a reaction time of 2.5 seconds, coefficient of friction 0.7 and brake efficiency of 50% in either case. (06 Marks)
- c. Explain briefly the steps of superelevation design. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. Distinguish between Bitumen and Tar. (04 Marks)  
 b. Explain the various properties of Road aggregates. (06 Marks)  
 c. Define the modulus of subgrade reaction. With the sketch explain the plate load test for determining the k value. (06 Marks)

**OR**

- 6 a. Explain ESWL. How is it determined for dual wheel assembly? (04 Marks)  
 b. Explain the steps involved in the design of slab thickness of rigid pavement as per IRC 58:2002. (06 Marks)  
 c. The properties of the subgrade soil are given below:  
 Passing 75 micron IS sieve = 80%  
 Liquid limit = 58%  
 Plasticity index = 25%  
 Classify the soil by HRB system with group index value. (06 Marks)

**Module-4**

- 7 a. Write down the construction steps for wet mix macadam base course. (06 Marks)  
 b. Explain in detail the requirements specifications of materials and the construction steps / methods for Bituminous Concrete [BC] layer. (06 Marks)  
 c. Briefly explain the Rothfuch's method of proportioning of materials. (04 Marks)

**OR**

- 8 a. Explain in brief the construction of cement concrete pavements. (08 Marks)  
 b. Explain in brief the specifications of materials for WBM pavement. (08 Marks)

**Module-5**

- 9 a. What are the requirements of highway drainage system? (04 Marks)  
 b. Explain briefly the design of filter material used in subsurface drains. (08 Marks)  
 c. Explain the cross drainage structures in brief. (04 Marks)

**OR**

- 10 a. Explain in brief any three methods of economic evaluation of highway projects. (06 Marks)  
 b. Explain in brief the various factors affecting the vehicle operation cost. (06 Marks)  
 c. Explain BOOT with respect to highway financing. (04 Marks)

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# CBCS SCHEME

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## Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Water Supply and Treatment Engineering



15CV64

Time: 3 hrs.

Max. Marks: 80

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Explain the need and importance of protected water supply to a community. (05 Marks)
- b. Explain briefly different types of water demand. (05 Marks)
- c. Briefly explain :
  - (i) Factors affecting per capita demand of water.
  - (ii) Factors affecting design period (06 Marks)

OR

- 2 a. List different methods of populations forecasting. Explain briefly any two methods. (08 Marks)
- b. The population census of a city is as shown in the following table. Estimate the expected population of the city by 2041 using arithmetical increase method and geometrical increase method.

Year	1971	1981	1991	2001	2011
Population in lakhs	1.50	1.85	2.18	2.50	2.85

(08 Marks)

### Module-2

- 3 a. What are the objectives of water treatment? Draw a flow chart of conventional water treatment plant and indicate various units. (08 Marks)
- b. Classify various sources of water and explain briefly their suitability with respect to quantity and quality for a town. (08 Marks)

OR

- 4 a. What is sampling of water? Discuss the objectives of sampling and preservative techniques. (06 Marks)
- b. Explain briefly physical, chemical and bacteriological water quality characteristics. (06 Marks)
- c. Give the maximum permissible limits as per the BIS for the following water quality parameters:
  - (i) Total hardness
  - (ii) Fluoride
  - (iii) Nitrate
  - (iv) Iron. (04 Marks)

### Module-3

- 5 a. What is Sedimentation process? With the help of sketch of an ideal settling tank, show that the efficiency of the settling tank is independent of its depth. (05 Marks)
- b. Design a set of here circular settling tanks to handle 6 million litres of water per day. Take detention time as 4 hours and side water depth as 3m. Check for the design and sketch the designed tank. (06 Marks)
- c. What is coagulation of water? Estimate the quantity of alum required per month at a treatment plant to treat 10 MLD of water with alum dosage of 20 mg/l. (05 Marks)

OR

- 6 a. Briefly explain the mechanism of filtration. (04 Marks)
- b. With the help of a sketch explain the working of a rapid sand filter. (06 Marks)

1 of 2

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- c. Design a set of Ten slow sand filter units to treat water for a town of 2 lakh population with assured water supply of 135 lpcd and maximum daily water is 1.5 times the average demand. The rate of filtration is 200 litres per square metre per hour (06 Marks)

#### Module-4

- 7 a. What are the objectives of water softening? Give a comparison of Lime - Soda process with Zeolite process of water softening. (05 Marks)
- b. A river was proposed as the raw water source for a near by town. Chemical analysis of the water indicates the constitutes as given below. If the hardness of water supplied to the residents is to be limited to 160 mg/l, determine the need of softening if any.
- |   |                            |
|---|----------------------------|
| Zn = 4 mg/l                             | Na <sup>+</sup> = 18 mg/l  |
| Cl <sup>-</sup> = 68 mg/l               | Mg <sup>2+</sup> = 16 mg/l |
| SO <sub>4</sub> <sup>2-</sup> = 20 mg/l | Ca <sup>2+</sup> = 60 mg/l |
| Turbidity = 45 mg/l                     | Alkalinity = 45 mg/l       |
- Given equivalent weight of Ca<sup>2+</sup> = 20; Mg<sup>2+</sup> = 12.2 and CaCO<sub>3</sub> = 50. (05 Marks)
- c. Estimate the quality of Zeolite required to soften 2 MLD of water with hardness 360 mg/l which should be reduced to 60 mg/l. The interval between successive regeneration is 4 hours and the capacity of exchanger is 24000 grams/cu.m. (06 Marks)

#### OR

- 8 a. What is disinfection of water? What are the requirements of a good disinfectant? (04 Marks)
- b. A college hostel having 500 students used well water for drinking. The rate of water supply is 120 lpcd. The water is to be disinfected using bleaching powder containing 25% chlorine available. Determine the monthly requirement of the bleaching powder with the following data:
- (i) Chlorine demand of well water = 1.2 mg/l
  - (ii) residual Chlorine expected = 0.2 mg/l
- (06 Marks)
- c. Write a note on : (i) Fluoridation (ii) De-fluoridation (06 Marks)

#### Module-5

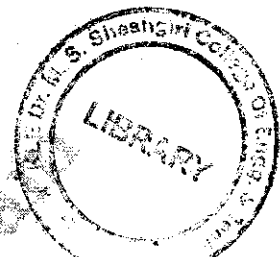
- 9 a. What are intake works? What are the factors to be considered for selection of site intake structures? (05 Marks)
- b. Write a note on : (i) Pumps and their types (ii) Pipe materials and pipe appurtenances (06 Marks)
- c. A town with prospective population of 80,000 is to be supplied with water from a river 5 km away and 25m below the level of the town. Design the economical section of the rising main and pumping unit where power is available. Take water supply rate as 150 lpcd and  $f = 0.01$ . Assume other relevant details if required. Given pumping hours = 12/day. (05 Marks)

#### OR

- 10 a. Explain the various methods of water distribution system. (05 Marks)
- b. For the water supply of a small rural town with the population of 10,000 with the rate of water supply as 100 lpcd. It is proposed to construct a distributing reservoir. The pattern of draw off is as under.
- |               |       |                    |
|---------------|-------|--------------------|
| 5 am to 10 am | ..... | 75% of days supply |
| 10 am to 4 pm | ..... | 10% - " -          |
| 4 pm to 9 pm  | ..... | 13% - " -          |
| 9 pm to 5 am  | ..... | 2% - " -           |
- The pumping is to be done for 8 hrs per day (8 am to 4 pm). Determine the storage capacity of the reservoir. (06 Marks)
- c. Write a note on different types of water distribution reservoir. (05 Marks)

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# CBCS SCHEME



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Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020

## Solid Waste Management

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Define the term Solid waste. Classify the solid waste material. (08 Marks)  
b. Estimate the moisture content, density of the solid waste samples with the following data (based as 100 kg). (08 Marks)

Component	% by mass	Typical % moisture	Typical density kg/m <sup>3</sup>
Food waste	15	70	290
Paper	45	6	85
Plastic	10	2	65
Wood	5	20	240
Cardboard	10	5	50
Tin cans	5	3	90
Garden Trimmings	10	60	105

OR

- 2 a. Explain with neat sketch, hauled container and stationary container system. (08 Marks)  
b. Explain the factors that must be considered in the design of transfer station. (08 Marks)

### Module-2

- 3 a. Explain various processing techniques used in solid waste management. (08 Marks)  
b. With the help of neat sketch, describe the conventional municipal incinerator. (08 Marks)

OR

- 4 a. Explain the factors that should be considered in evaluating onsite processing techniques. (08 Marks)  
b. What are the emission control facilities and equipments for municipal incinerator? (08 Marks)

### Module-3

- 5 a. Describe the basic steps involved in indoor process of composting, with neat sketch. (08 Marks)  
b. Discuss the important design considerations for aerobic composting process. (08 Marks)

OR

- 6 a. What are the factors to be considered in the selection of site for a sanitary landfill? (08 Marks)  
b. Explain with the help of neat sketch, control of gas movement in landfills. (08 Marks)

### Module-4

- 7 a. Explain the three stages of biomedical waste disposal. (08 Marks)  
b. Briefly explain E-waste disposal methods. (08 Marks)

OR

1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 8 a. Define Hazardous waste. How do you classify hazardous waste? (08 Marks)  
b. Explain the sources of construction wastes generated from the construction activities. (08 Marks)

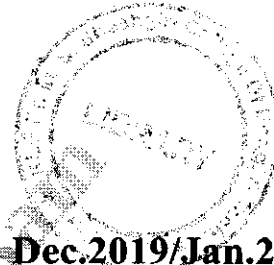
**Module-5**

- 9 a. Explain the process of pyrolysis and mention the conversion products resulting from pyrolysis. (08 Marks)  
b. Explain the effect of 3T's in incineration process of solid waste. (08 Marks)

**OR**

- 10 a. Explain with the help of flow chart for the recovery of ferrous materials and energy from solid wastes. (08 Marks)  
b. Write a flow sheer for the process of Refuse Derived Fuel (RDF) either power form or pallet form. (08 Marks)

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15CV653

## Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Alternative Building Materials

Time: 3 hrs.

Max. Marks: 80

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- Discuss the environmental issues concerned to the building materials. (08 Marks)
  - Compute the energy embodied in a wall made of burnt bricks with cement mortar 1:6. The wall is  $5 \times 3 \times 0.23$  m. Take energy in burnt Brick is 4.25 MJ, energy in cement mortar 1:6 as 1296 MJ. If this wall is build with SMB of size  $230 \times 190 \times 100$  mm using CM 1:6. What is the saving in energy in building material if energy per block is 2.60 MJ. (08 Marks)

OR

- Illustrate the concept of green buildings and rating systems as per IGBC. (08 Marks)
  - Distinguish the various environmental friendly and cost effective building technologies. (08 Marks)

### Module-2

- Discuss the characteristics of building blocks used for wall construction. (08 Marks)
  - Elaborate the various step involved in manufacturing of SMB blocks. (08 Marks)

OR

- What are the various factors affecting the compressive strength of masonry? Explain them briefly (08 Marks)
  - Design an interior cross wall axially loaded of a 2 storied building to carry 100 mm thick RCC slabs with 3m ceiling height. The wall is unstiffened and it supports 2.65m wide slab. L.L. on the roof is  $1.5 \text{ kN/m}^2$ , L.L. on floor =  $2 \text{ kN/m}^2$  weight of 80mm thick terrace =  $1.96 \text{ kN/m}^2$ . Weight of floor finish =  $0.2 \text{ kN/m}^2$ . Take density of concrete =  $25 \text{ kN/m}^3$ . (08 Marks)

### Module-3

- Explain the process of making Lime Pozzolona Cement. (08 Marks)
  - List the different manufacturing process of fibre reinforced plastics and explain any two with neat sketch. (08 Marks)

OR

- Explain the different types of fibres used in fibre reinforced concrete. (08 Marks)
  - List the various types of agro and industrial wastes and explain its properties. (08 Marks)

### Module-4

- Explain the alternative technologies used for foundation and walls construction. (08 Marks)
  - Explain Ferrocement and Ferroconcrete. (08 Marks)

OR

- Explain the filler slab concept of alternative roofing system. (08 Marks)
  - Explain the Mivan construction technique. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg,  $42+8 = 50$ , will be treated as malpractice.

**Module-5**

- 9 a. Explain the equipments used for the compaction of concrete. (08 Marks)  
b. Discuss the equipments used for production of SMB locks. (08 Marks)

**OR**

- 10 a. What are the moulds and methods for production of precast elements? (08 Marks)  
b. Explain the cost saving techniques adopted in buildings. (08 Marks)

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OR

- 6 a. Explain with a neat sketch, the working principles of a trickling filter. (08 Marks)  
b. Briefly explain the terms : i) Suspended growth ii) Activated sludge  
iii) Sludge digester iv) Sequential batch reactors. (08 Marks)

**Module-4**

- 7 a. Explain the effects of effluent discharge on the stream water quality. (08 Marks)  
b. What is meant by strength reduction? Explain the various methods of strength reduction being adopted in the industries. (08 Marks)

OR

- 8 a. List and explain the methods of removal of colloidal solids from wastewater. (08 Marks)  
b. Explain the principles of raw and partially treated wastes before discharged into streams. (08 Marks)

**Module-5**

- 9 a. With the help of a flow diagram, explain the treatment units suggested to treat wastewater from a tanning industry along with wastewater characteristics. (08 Marks)  
b. State the sources and characteristics of the wastewater from dairy industry. (08 Marks)

OR

- 10 a. With the help of a line diagram, explain the process of paper and pulp industry highlighting the sources of wastewater generation. (08 Marks)  
b. Discuss the characteristics and treatment of waste water from a pharmaceutical industry. (08 Marks)

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## Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Design of RCC and Steel Structures

Time: 3 hrs.

Max. Marks: 80

- Note:** 1. Answer any TWO full questions, choosing ONE full question from each module.  
 2. Use of IS456, IS800, SP(6)-Steel Table is permitted.  
 3. Assume any missing data suitably.

### Module-1

- 1 Design a reinforced concrete combined rectangular slab footing for two columns located at 4.5 m apart. The overall sizes of the columns are 400mm × 400mm and 600mm × 600mm and they are transferring 600 kN and 1000 kN respectively. The centre of the lighter column is 0.4m from the property line. The safe bearing capacity of the soil 150 kN/m<sup>2</sup>. Use M20 concrete and Fe 415 steel. Sketch the reinforcement details. (40 Marks)

OR

- 2 Design a cantilever retaining wall to retain an earth embankment with a horizontal top 3.5m above ground level. Density of earth 18 kN/m<sup>3</sup>, angle of internal friction  $\phi = 30^\circ$ . SBC of soil is 200 kN/m<sup>3</sup>. Take coefficient of friction between soil and concrete 0.5, Adopt M20 grade concrete and Fe 415 steel. (40 Marks)

### Module-2

- 3 The centre line of a roof truss is as shown in the Fig.Q3. The forces in the members of the truss due to dead load, live load and wind load is given below: Design the roof truss member using M16 bolts of property class 4.6. Also design a bearing plate and anchor bolts for a pull of 40 kN. Use M20 grade concrete. Draw to suitable

(i) Elevation of truss greater than half space (ii) Support details.

Member	DL (kN)	LL (kN)	WL (kN)
AB	+14.37	+21.80	-37.32
BC	+11.64	+17.60	-32.08
CD	+12.05	+18.26	-35.90
DE	-5.13	+7.70	+14.70
EC	+2.77	+4.18	-8.42
EB	+2.77	+4.18	-9.15
EA	-12.85	-19.36	+31.69
EF	-7.69	-11.61	+15.63

Sign :- + ⇒ Compression  
 - ⇒ Tension

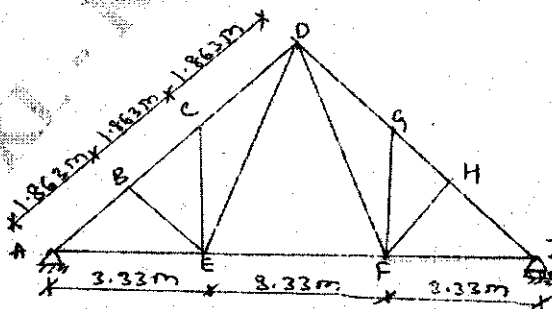


Fig.Q3

(40 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42-8 = 50, will be treated as malpractice.

OR

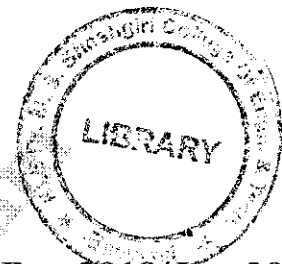
4 Design a simply supported gantry girder to carry an electrically operated travelling crane with the following details:

- (i) Span of the crane bridge  $\Rightarrow$  25 m
- (ii) Span of the gantry girder  $\Rightarrow$  8 m
- (iii) Wheel base  $\Rightarrow$  3.5 m
- (iv) Crane capacity  $\Rightarrow$  200 kN
- (v) Weight of crane bridge  $\Rightarrow$  150 kN
- (vi) Weight of trolley (crab)  $\Rightarrow$  75 kN
- (vii) Minimum hook distance  $\Rightarrow$  1.0 m
- (viii) Weight of rail  $\Rightarrow$  0.30 kN/m
- (ix) Height of rail  $\Rightarrow$  105 mm

Draw neatly cross section of gantry girder showing all details. Also draw side view.

(40 Marks)

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15CV73

## Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. With a neat sketch, explain the Engineering representation of the Hydrologic cycle. (08 Marks)
- b. Briefly explain with a neat sketch, the i) Moving average curve ii) Mass curve  
iii) Rainfall hyetograph iv) Forms of precipitation. (08 Marks)

**OR**

- 2 a. With a Table, explain Global and Indian water availability. (05 Marks)
- b. Write a note on optimum number of rain gauge stations. (05 Marks)
- c. The average annual rainfall of 8 rain gauge stations in a basin are 1000, 950, 900, 850, 800, 700, 600, 400 mm. If the permissible error is 6%. Determine the optimum number of rain gauges required in the basin. (06 Marks)

### Module-2

- 3 a. Explain what is evapo – transpiration and also factors affecting evapo – transpiration. (08 Marks)
- b. Describe how the estimation of evaporation is carried by  
i) Meyer's equation ii) Rohwer's equation. (08 Marks)

**OR**

- 4 a. Describe the method of determining infiltration capacity using a double ring infiltrometer. (06 Marks)
- b. A reservoir with average surface spread of 4.8 km<sup>2</sup> in the first week of November has the water surface temperature of 30°C and relative humidity of 40%. Wind velocity measured at 3.0m above the ground is 18km/h. The mean barometer reading is 760mm of Hg. Calculate the average evaporation loss from the reservoir in mm/day and the total depth and volume of evaporation loss in the first week of November. Use both Meyer's equation as well as Rohwer's equation. Take saturation vapour pressure at 30°C as 31.81mm of Hg. (10 Marks)

### Module-3

- 5 a. Define Runoff. Explain the factors affecting Runoff. (05 Marks)
- b. Explain with a neat sketch, components of storm hydrograph. (05 Marks)
- c. Find the ordinates of a flood hydrograph resulting from a storm with rainfalls of 2.50 , 6.85 and 3.75cm each during success –ve 3 hours. The ordinates of a 3 hour UHG are given below. Assume an initial loss of 5mm – infiltration index ,  $\phi = 2.5$  mm/hr , Base flow = 12 cumec.

Time (hours)	3	6	9	12	15	18	21	24	3	6	9	12	15	18	21	24
UHG ordinates (cumec)	0	115	370	510	395	315	252	231	112	127	96	64	43	25	12	0

(06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Explain Rainfall – Runoff correlation analysis. (04 Marks)  
 b. Define Unit Hydrograph. Explain with a neat sketch, the derivation of unit Hydrograph. State its assumption, application and limitations. (08 Marks)  
 c. Given the ordinates of a 4 – h unit hydrograph as below derive the ordinates of a 12 – h unit hydrograph for the same catchment. (04 Marks)

Time (hr)	0	4	8	12	16	20	24	28	32	36	40	44
Ordinates of 4h UH (m <sup>3</sup> /sec)	0	20	80	130	150	130	90	52	27	15	05	0

**Module-4**

- 7 a. with neat sketches. Explain Band hara Irrigation. List its advantages and disadvantages. (06 Marks)  
 b. Define Irrigation. What are the necessity of irrigation? (05 Marks)  
 c. Explain the various irrigation efficiencies. (05 Marks)

OR

- 8 a. Explain with neat sketch, the variation of Duty with the places of its measurement. (06 Marks)  
 b. What are the different methods adopted to improve duty of water? (05 Marks)  
 c. With a neat sketch, explain different systems of irrigation. (05 Marks)

**Module-5**

- 9 a. Write a note on Canal classification. (04 Marks)  
 b. Briefly explain the Lacey's Regime theory. (06 Marks)  
 c. Write with a neat sketch, the calculation of Reservoir capacity for a specified yield from the mass inflow curve. (06 Marks)

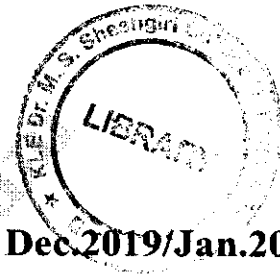
OR

- 10 a. Define the following : i) Gross command area ii) Cultural command area  
 iii) Crop factor iv) Time factor (04 Marks)  
 b. Explain with a neat sketch, zones of storage in a Reservoir. (04 Marks)  
 c. A channel section has to be designed for the following data :

Discharge  $Q = 30$  cumes ; Silt factor  $f = 1.00$  ; Side slope =  $\frac{1}{2} : 1$ .

Find also the longitudinal slope. (08 Marks)

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15CV741

## Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Design of Bridges

Time: 3 hrs.

Max. Marks: 80

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of codes IRC-6, IRC-21, IRC-112, IS-456, SP-16 and Pigeaud's curves are permitted.

### Module-1

- 1 a. Classify bridges based on various parameters. (10 Marks)  
b. What are the different types of loads acting on a bridge? (06 Marks)

OR

- 2 a. What is meant by economic span? Derive the expression for economic span. (08 Marks)  
b. Determine the linear waterway for a bridge across a stream with a flood discharge of  $200 \text{ m}^3/\text{s}$ , velocity  $1.4 \text{ m/s}$  and width of flow at high flood level  $52.0 \text{ m}$ , if the allowable velocity under the bridge is  $1.75 \text{ m/s}$ . (08 Marks)

### Module-2

- 3 A reinforced concrete slab bridge has a clear span of  $5.5 \text{ m}$  and has the following data:  
Width of bearing on either side =  $500 \text{ mm}$   
Clear width of carriage way =  $7.5 \text{ m}$   
Width of footpath on either side =  $1.0 \text{ m}$   
Wearing coat thickness =  $80 \text{ mm}$   
Live load expected – Class AA tracked vehicle  
Grade of concrete = M30  
Grade of Steel = Fe 415  
Design and detail the slab bridge. (16 Marks)

OR

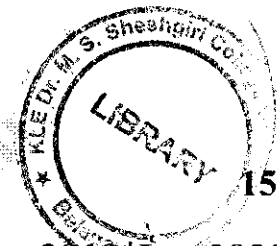
- 4 a. What is meant by a skew slab bridge? (02 Marks)  
b. What are the differences between a straight slab bridge and a skew slab bridge? (06 Marks)  
c. Sketch typical reinforcement detailing of skew slab bridges. (08 Marks)

### Module-3

- 5 Design and detail the interior slab of a T-beam bridge with the following data:  
Spacing of longitudinal main girders =  $3.0 \text{ m}$   
Spacing of cross girders =  $3.75 \text{ m}$   
Thickness of deck slab =  $200 \text{ mm}$   
Thickness of wearing coat =  $80 \text{ mm}$   
Live load = Class AA, tracked vehicle  
Grade of concrete = M30  
Grade of steel = Fe415 (16 Marks)



# CBCS SCHEME



15CV742

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Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020

## Groundwater and Hydraulics

Time: 3 hrs.

Max. Marks: 80

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. With a neat sketch, explain the vertical distribution of Ground water. (08 Marks)
- b. Explain in brief the occurrence of Ground water in different types of rocks and soils. (08 Marks)

OR

- 2 a. Explain the importance of Ground water. (08 Marks)
- b. What is an aquifer? Explain different types of Aquifers, with a neat sketch. (08 Marks)

### Module-2

- 3 a. Define Specific yield, Specific retention and Porosity. Derive a relationship between them. (08 Marks)
- b. It is observed in a field test that 3 hr 20 min was required for a tracer to travel from one well to another 20m apart and the difference in their water surface elevations was 0.5m. Samples of the aquifer between the wells indicated a porosity of 15%. Determine the permeability of the aquifer seepage velocity and the Reynolds number for the flow assuming an average grain size of 1mm and kinematic viscosity of water at 27°C is 0.008 stoke. (08 Marks)

OR

- 4 a. With a neat sketch, explain Darcy's law discuss its validity and limitations. (08 Marks)
- b. Derive an expression for one dimensional steady flow in homogenous unconfined aquifer. (08 Marks)

### Module-3

- 5 a. What are the assumptions made in their method? Explain Thei's method to determine formation constants T and S for unsteady radial flow towards well. (06 Marks)
- b. Derive the discharge equation for steady radial flow into a well in a confined aquifer. (06 Marks)
- c. A tube well of 30cm diameter penetrates fully in an artesian aquifer. The strainer length is 15m. Calculate the yield from the well under a drawdown of 3m. The aquifer consists of sand of effective size of 0.2mm having coefficient of permeability equal to 50m/day. Assume radius of drawdown equal to 150 meters. (04 Marks)

OR

- 6 a. Explain Cooper Jacob methods of solutions for unsteady radial flow in a confined aquifer. (08 Marks)
- b. A 30 cm well penetrates 49.99m below the static water table. After a long period of pumping at a rate of 1799 lpm, the drawdown in the wells at 15 and 44.99m from the pumped well were 1.69 and 0.79m respectively. Determine the transmissibility of the aquifer. What is the drawdown in the pumped well? (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-4**

- 7 a. Explain with a neat sketch, the Electrical resistivity (surface) method for ground water exploration. (08 Marks)  
b. Explain the Sonic logging with equation. (08 Marks)

**OR**

- 8 a. Explain with a neat sketch the Seismic Refraction method for Ground water exploration. (08 Marks)  
b. With a neat sketch, Electric logging for Ground water Exploration. (08 Marks)

**Module-5**

- 9 a. Explain the different types of wells also give the method of construction for any one of the well. (08 Marks)  
b. With the neat sketches, explain the various methods of Ground water recharge. (08 Marks)

**OR**

- 10 a. Explain what is conjunctive use of water also explain its necessity , technique involved of economics. (08 Marks)  
b. Describe what are the pumps used for lifting water from wells, also explain the working principle of centrifugal pump. (08 Marks)

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15CV744



## Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Structural Dynamics

Time: 3 hrs.

Max. Marks: 80

**Note: Answer FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Define the following terms:
  - (i) Amplitude      (ii) Damping      (iii) Resonance      (iv) Free vibration

(04 Marks)
- b. Derive equation of motion for a freely vibrating undamped SDOF system and obtain its solutions. (12 Marks)

OR

- 2 a. Define logarithmic decrement and derive an expression for logarithmic decrements. (09 Marks)
- b. An SDOF system having mass of 2.5 kg is subjected to free vibration with viscous damping. The frequency of oscillation is found to be 20 Hz and measurement of the amplitude of vibration shows two successive amplitudes to be 6 mm and 5.5 mm. Determine the damping coefficient. (07 Marks)

### Module-2

- 3 a. Derive the expression for Duhamel's integral for the response of SDOF system subjected to arbitrary excitation. (08 Marks)
- b. An SDOF system consists of a mass of 20 kg, a spring of stiffness 2200 N/m and a dashpot with a damping coefficient of 60 N.S/m is subjected to a harmonic excitation of  $F = 200\sin 5t$ . Write the complete solution of the equation of motion. (08 Marks)

OR

- 4 Derive an equation of motion for a damped harmonic excitation of a SDOF vibrating system and obtain its complete solution. (16 Marks)

### Module-3

- 5 a. Explain the concept of shear building. (06 Marks)
- b. Determine the natural frequencies of the system shown in Fig.Q5 (b). (10 Marks)



Fig. Q5 (b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 6 Determine the natural frequencies and mode shapes for the structure as shown in Fig. Q6.

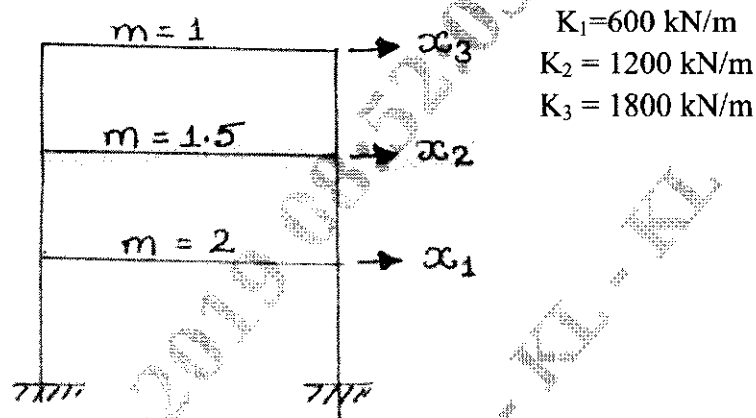


Fig. Q6

(16 Marks)

**Module-4**

- 7 a. What do you mean by decoupling of equations? Explain the concept of modal superposition method. (08 Marks)  
 b. Explain orthogonality principle. (08 Marks)

OR

- 8 Determine the natural frequencies and mode shapes for the given system. (16 Marks)



Fig. Q8

**Module-5**

- 9 a. Explain proportional damping in detail. (08 Marks)  
 b. Calculate the natural frequencies, mode shapes and damping ratio's for a proportionally damped system given by:

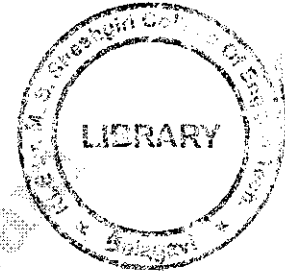
$$[M] = \begin{bmatrix} 9 & -1 \\ -1 & 1 \end{bmatrix}; [C] = \begin{bmatrix} 3 & -1 \\ -1 & 1 \end{bmatrix} \text{ and } [K] = \begin{bmatrix} 49 & -2 \\ -2 & 2 \end{bmatrix}. \quad (08 \text{ Marks})$$

OR

- 10 a. Explain consistent and Lumped mass matrices. (08 Marks)  
 b. Estimate the first 3 natural frequencies of a clamped free bar of length  $\ell$  in torsional vibration by using a lumped mass model and 4 elements. (Element length =  $\frac{\ell}{4}$ ). (08 Marks)

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2 of 2



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15CV751

## Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Urban Transportation and Planning

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Define "System Approach". Explain with flow diagram system approach to transport planning. (08 Marks)
- b. List merits and demerits of mass transit system. (08 Marks)

**OR**

- 2 a. What is mass transit system? Explain "Para – transit" transport and "Mass and Rapid transit system". (08 Marks)
- b. Write a note on BRTS and metro rails. (08 Marks)

### Module-2

- 3 a. What are the various surveys to be carried out in transportation planning process? Explain. (08 Marks)
- b. List and briefly explain the types of inventory of transport facilities. (08 Marks)

**OR**

- 4 a. Write a note on "Study area" and "Zoning". List the factors affecting on zoning. (08 Marks)
- b. Define External cordon line. Explain the various factors considered in selection of external cordon line. (08 Marks)

### Module-3

- 5 a. What is Category analysis? What are the advantages and disadvantages of category analysis? (08 Marks)
- b. The following information was obtained from a transportation survey of a town. Develop a linear regression (of type  $y = a + bx$ ) model for estimating the trips generated from a zone. If the population in a particular zone increases to 40,000 predict the expected trip generation from that zone. (08 Marks)

Zone No	1	2	3	4	5	6	7	8
Population in the zone (thousands)	26	28	31	33	22	30	20	25
Total trips generated (in hundreds)	12	11	17	15	12	15	9	13

**OR**

- 6 a. What is Trip distribution? Briefly explain average factor method and mention the disadvantages of the method. (08 Marks)
- b. Obtain the future trip table by uniform growth factor method [Table : Q6(b)]. (05 Marks)

Table Q6(b)

	O \ D	1	2	3	T <sub>i</sub>
1		60	100	200	360
2		100	20	300	1260
3		200	300	20	3120

1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. Trip originating from zone 1,2, 3 of study area are 78, 92 and 82 respectively. If the growth factor is 1.3 and cost matrix is shown in table Q6(c). Find the expanded origin constrained growth trip table.

Table Q6(c)

	1	2	3	$O_i$
1	20	30	28	78
2	36	32	34	92
3	22	34	26	82
$O_j$	88	96	78	252

(03 Marks)

**Module-4**

- 7 a. What are opportunity model? Explain types of opportunity model. (06 Marks)  
 b. Define Modal split. Explain in brief the factors affecting modal split. (10 Marks)

**OR**

- 8 A self contained town consists of 4 residential areas A, B, C, D and 2 industrial states X and Y. Generation equations show that for the design year in question, the trips from home to work generated by each residential area per 24 hour day are as follows :

A	B	C	D
1000	2250	1750	3200

There are 3,700 jobs in industrial estate X and 4,500 in industrial estate Y. It is known that the attraction between zones is inversely proportional to the square of the journey time between zones. The journey times in minutes from home to work are :

Zones	A	B	C	D
X	15	15	10	15
Y	20	10	10	20

Calculate and tabulate the inter zonal trips for journeys from home to work. (16 Marks)

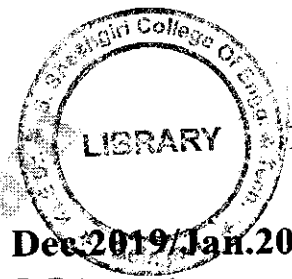
**Module-5**

- 9 a. What are the applications of traffic assignment? (08 Marks)  
 b. Write a note on :  
 i) All or nothing assignment      ii) Capacity Restraint assignment. (08 Marks)

**OR**

- 10 a. Explain land use planning models. (10 Marks)  
 b. Write a note on user equilibrium assignment. (06 Marks)

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15CV753

## Seventh Semester B.E. Degree Examination, Dec 2019/Jan.2020 Rehabilitation and Retrofitting of Structures

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1 ✓

1 Write a short note on:

- a) Freeze and Thaw on concrete      b) Thermal movement in concrete      (16 Marks)

OR

2 Write a short note on:

- a) Chloride attack on the concrete      b) Alkali silica reaction.      (16 Marks)

### Module-2

- 3 a. Briefly explain the purpose of assessment.      (06 Marks)  
b. Explain briefly the investigation of damage.      (10 Marks)

OR

4 Write short note on:

- a. Ultrasonic pulse velocity method ✓  
b. Windsor HP probe system.      (16 Marks)

### Module-3 ✓

- 5 a. Briefly explain the effect of temperature on concrete.      (08 Marks)  
b. Briefly explain the effect of wear and erosion on concrete.      (08 Marks)

OR

- 6 a. List the factors influencing the corrosion process.      (03 Marks)  
b. List the corrosion protection techniques and explain any three of them.      (13 Marks)

### Module-4 ✓

- 7 a. Define maintenance engineering. Explain the classification of maintenance.      (10 Marks)  
b. Give the importance of maintenance.      (06 Marks)

OR

- 8 a. Give the factors or reasons which are needed for strengthening of concrete structures (any 04).      (04 Marks)  
b. With neat figure explain: i) Jacking technique      ii) Externally bonding technique.      (12 Marks)

### Module-5

9 Write a short note on:

- a. Aramid fibers  
b. Carbon fibers  
c. Natural fibers  
d. Rust eliminators.      (16 Marks)

OR

10 Write short note on:

- a. Short Crete  
b. Epoxy Injection. ✓      (16 Marks)

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15CV82

**Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Design of Prestressed Concrete Elements**

Time: 3 hrs.

Max. Marks: 80

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
 2. Use of IS 1343-1980 is permitted.*

**Module-1**

- 1 a. Explain the need for High Strength conc and higher grade steel for PSC member. (04 Marks)
- b. Define Pre-stressed Concrete. Explain the different types of Pre-stressed Concrete. (04 Marks)
- c. A PSC inverted T beam section web 300×900mm. Flange 300×600mm simply supported over a span of 15m. The beam is tensioned by 3 cables each containing 12 wires of 7 mm diameter placed at 150mm from soffit at midspan. If the initial prestress is 1000 N/mm<sup>2</sup> calculate the max UDL the beam can carry maximum compressive stress is limited to 15 MPa and tensile stress is limited to 1 MPa. Assume 15% loss of pre stress. (08 Marks)

OR

- 2 a. Explain Load Balancing Concept. (02 Marks)
- b. Explain post tensioning anchorages devices and explain any one in details. (06 Marks)
- c. A rectangular beam 200×300mm is pre-stressed by 15 wires of 5 mm diameter located at 65mm from bottom and 3 wires of 5mm diameter at 25mm from top initial pre-stress is 840 N/mm<sup>2</sup>. Calculate stress at midspan. (08 Marks)

**Module-2**

- 3 a. Define loss of pre-stress. Explain different loss of pre-stress with suitable example. (06 Marks)
- b. A post tensioned concrete beam 100×300mm span 10m is pre-stressed successively, tensioned and anchored by 3 cables each having C/S area 200 mm<sup>2</sup>. Initial pre stress is 1200 N/mm<sup>2</sup>. First cable is parabolic with e = 50mm at mid span and e = 50mm above NA at support. Second cable is parabolic with e = 50 at midspan and zero at support. Third cable is straight cable with 50mm eccentricity. Find the loss of pre-stress due to elastic deformation. Take m = 6. (10 Marks)

OR

- 4 a. Derive the expression for deflection for a beam of length l subjected to point load at mid span, UDL. Two point load symmetrically placed at middle third point. Prestress P applied on a straight cable with e as eccentricity and a parabolic cable with e = 0 at support and e at mid span. (06 Marks)
- b. A simply supported beam having span 6m is post tensioned by 2 cable both having e = 50mm at mid span. First cable is parabolic and anchored 100mm above CG at support. Second cable is straight. C/s of each cable is 200mm<sup>2</sup> and initial prestress is 1200 N/mm<sup>2</sup>. Area of cone 2×10<sup>4</sup> mm<sup>2</sup> radius of gyration 120mm. The beam support a two point load each 20 kN at middle third point E<sub>c</sub> 38 kN/mm<sup>2</sup>. Calculate (i) Short term deflection (ii) Long term deflection. Take φ = 2. Loss of prestress 20%. (10 Marks)

**Module-3**

5. An unsymmetrical I section having top flange 750×200mm bottom flange 450×250mm thickness of web 150mm overall depth 1000mm. If permissible tensile and compressive stress at transfer and working load are not to exceed zero in tension  $15 \text{ N/mm}^2$  in compression. Determine P and e to resist self weight and applied moment 1012 kNm and 450 kNm. Assume loss of pre stress 15%. (16 Marks)

**OR**

6. Design a post tensioned girder which is spaced 2.4 m c/c and has an effective span of 9m. Live load  $15 \text{ kN/m}^2$ , DL( $3 \text{ kN/m}^2$  + Self weight). Compressive stress at transfer and working load are  $14 \text{ N/mm}^2$  and  $12 \text{ N/mm}^2$  tension is  $1 \text{ N/mm}^2$  at all stages of loading loss Ratio 0.8. Determine number of 7mm diameter wires required if permissible tension is  $1000 \text{ N/mm}^2$ . Assume cover as 100 mm. (16 Marks)

**Module-4**

- 7 a. Explain types of shear cracks. (04 Marks)  
b. A PSC beam 250mm wide 150mm deep is subjected to SF 900 kN fiber stress under working load is  $4 \text{ N/mm}^2$  effective pre-stress is  $1000 \text{ N/mm}^2$  and area of cable is  $1500 \text{ mm}^2$ . Design shear reinforcement slope of cable at support is (1/6). (12 Marks)

**OR**

8. A pre-stressed concrete beam of span 10m, cross section 120mm × 300mm is prestressed by a cable carrying a force of 180 kN the beam support a UDL 5 kN/m including self weight compare the magnitude of principal tension with and without axial pre-stress. Estimate the reduction in principal stress. Also find % reduction if a parabolic cable used with e = 50 mm at mid span and zero at support. (16 Marks)

**Module-5**

- 9 a. Explain stress distribution in End Block. (04 Marks)  
b. Explain Indian Standard Code IS-1343 method for calculation of Bursture force. (04 Marks)  
c. The end block of a post tensioned pre-stressed concrete beam 300mm × 300mm is subjected to a pre-stressing force 832.8 kN. Anchorage area  $11720 \text{ mm}^2$ . Design suitable anchorage reinforcement. (08 Marks)

**OR**

- 10 a. Explain composite construction in PSC members. (06 Marks)  
b. A composite T beam is made up of pre-tensioned web 100mm wide 200mm deep and a cast insitu slab 400mm wide 40mm thick having a modulus of elasticity  $28 \text{ kN/mm}^2$ . If the differential shrinkage is  $100 \times 10^{-6}$  units determined shrinkage stresses developed in the precast and cast insitu units. (10 Marks)

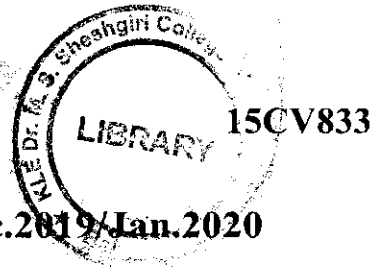
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# CBCS SCHEME

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## Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Pavement Design

Time: 3 hrs.

Max. Marks: 80

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- a. What are the desirable characteristics of pavement? (08 Marks)  
b. List out the difference between highway pavement and airfield pavement. (08 Marks)

OR

- a. List out the assumptions of Burmister's theory. (08 Marks)  
b. A dual wheel load assembly with 70kN load on each wheel and contact pressure of  $0.7\text{kN/mm}^2$  is applied on a homogeneous mass with modulus of elasticity  $12\text{N/mm}^2$ . If the centre to centre distance between the two wheel is 600mm, determine the deflection value at a depth of 0.5m at four points, at the centre of dual wheels and at radial distance of 300, 600 and 900mm from this centre along the line joining centers of the two wheel loads. Use deflection factor chart Fig.Q.2(b). (08 Marks)

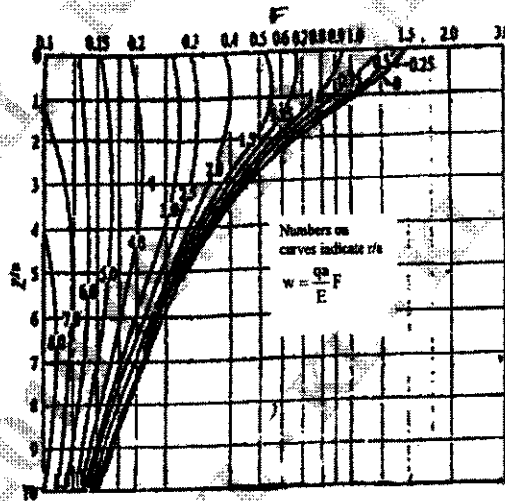


Fig.Q.2(b)

### Module-2

- a. What are the design factors considered in the design of pavement? Explain any three in detail. (08 Marks)  
b. Calculate the design repetition for 20 years period for various wheel loads equivalent to 22.68kN. Wheel load using the following data on a four lane road. (08 Marks)

Load kN	22.68	27.22	31.75	40.82	45.36	49.90	54.43
Volume per day	30	25	20	15	10	5	1

OR

- 4 a. Explain the significance of ESWL in pavement design. (08 Marks)
- b. It is proposed to widen an existing 4 lane NH section to 3 lane dual carriage way road. Design the pavement for new carriage way with following data:  
 Initial traffic in both directions = 4932 CVPD  
 Construction period = 20 months  
 Design life = 15 years  
 Design CBR of soil = 7%  
 Traffic growth rate = 8%  
 VDF = 4.5.  
 Land distribution factor = 75% (0.75)

## Pavement Design Catalogue

Plate 2- Recommended Designs for Traffic Range 10-150 msa

CBR 7%				
Cumulative traffic (msa)	Total pavement thickness (mm)	Pavement Composition		
		Bituminous Surfacing		Granular base and sub-base (mm)
		BC (mm)	DBM (mm)	
10	580	40	60	Base = 250
20	610	40	90	
30	630	40	110	
50	650	40	130	Sub-base = 230
100	575	50	145	
150	695	50	165	

(08 Marks)

Module-3

- 5 a. Explain different types of flexible pavement failure. (08 Marks)
- b. Explain the various design factors for runway pavement. (08 Marks)

OR

- 6 a. What are the causes of formation of waves and corrugations in flexible pavement? Suggest remedial measures. (08 Marks)
- b. Explain step by step procedure of conducting Benkleman beam-deflection studies for-evaluation of flexible pavement surface condition. (08 Marks)

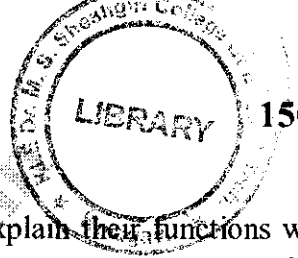
Module-4

- 7 a. Write Westergaard's load stress equations at critical regions and discuss critical combination of stresses. (08 Marks)
- b. Explain IRC recommendation's is the design of dowel bar, tiebar and RCC in pavements. (08 Marks)

OR

- 8 a. Calculate wheel load stresses at interior, edge and corners using Westergaard's equations for wheel load = 51kN, tyre pressure =  $0.75\text{N/mm}^2$ ,  $E = 30\text{kN/mm}^2$ ,  $K = 0.08\text{N/mm}^2$  slab thickness 250mm. (08 Marks)
- b. A cement concrete pavement has a thickness of 20cm on a 2 lane road of 7.5m with a longitudinal joint along the centre. Design the dimensions and spacing of tie bars for the following data: Working stress in tension  $S_s = 1400\text{ kg/cm}^2$  density of concrete  $W = 2500\text{kg/m}^3$ , friction coefficient 1.5. Allowable bond stress in concrete,  $S_b = 24.6\text{kg/cm}^2$ . (08 Marks)

2 of 3



**Module-5**

- 9 a. What are the various types of joints in C.C. pavements? Explain their functions with neat sketches. (08 Marks)
- b. Explain briefly the pavement evaluation. (08 Marks)

**OR**

- 10 a. Explain various types of rigid pavement failures, with neat sketch. (08 Marks)
- b. Explain the following:
  - i) Fatigue behavior of concrete
  - ii) Maintenance of Joints. (08 Marks)

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