

**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**

**JUNE / JULY 2019**

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# CBCS SCHEME



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17MAT31

## Third Semester B.E. Degree Examination, June/July 2019 Engineering Mathematics – III

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Obtain the fourier series of the function  $f(x) = x - x^2$  in  $-\pi \leq x \leq \pi$  and hence deduce  $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$  (08 Marks)
- b. Obtain the Half Range Fourier cosine series for the  $f(x) = \sin x$  in  $[0, \pi]$ . (06 Marks)
- c. Obtain the constant term and the coefficients of first sine and cosine terms in the fourier expansion of y given

x:	0	1	2	3	4	5
y:	9	18	4	28	26	20

(06 Marks)

OR

- 2 a. Obtain the fourier series of  $f(x) = \frac{\pi - x}{2}$  in  $[0, 2\pi]$  and hence deduce that  $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$  (08 Marks)
- b. Find the fourier half range cosine series of the function  $f(x) = 2x - x^2$  in  $[0, 3]$ . (06 Marks)
- c. Express y as a fourier series upto first harmonic given

x:	0	30	60	90	120	150	180	210	240	270	300	330
y:	1.8	1.1	0.30	0.16	1.5	1.3	2.16	1.25	1.3	1.52	1.76	2.0

(06 Marks)

### Module-2

- 3 a. Find the fourier transform of  $f(x) = \begin{cases} a^2 - x^2; & |x| \leq a \\ 0 & ; |x| > a \end{cases}$  and hence deduce  $\int_0^{\pi} \frac{\sin x - x \cos x}{x^3} dx = \frac{\pi}{4}$  (08 Marks)
- b. Find the fourier sine transform of  $e^{-|x|}$  and hence evaluate  $\int_0^{\infty} \frac{x \sin ax}{1+x^2} dx; a > 0$  (06 Marks)
- c. Obtain the z-transform of  $\cos n\theta$  and  $\sin n\theta$ . (06 Marks)

OR

- 4 a. Find the fourier transform of  $f(x) = xe^{-|x|}$ . (08 Marks)
- b. Find the fourier cosine transform of  $f(x)$  where

$$f(x) = \begin{cases} x & ; 0 < x < 1 \\ 2-x & ; 1 < x < 2 \\ 0 & ; x > 2 \end{cases}$$

(06 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.

- c. Solve  $u_{n+2} + 6u_{n+1} + 9u_n = 2^n$  with  $u_0 = u_1 = 0$  using z-transform. (06 Marks)

**Module-3**

- 5 a. Fit a straight line  $y = ax + b$  for the following data by the method of least squares.

x :	1	3	4	6	8	9	11	14
y :	1	2	4	5	7	8	9	

(08 Marks)

- b. Calculate the coefficient of correlation for the data:

x :	92	89	87	86	83	77	70	63	53	50
y :	86	83	91	77	68	85	54	82	37	57

(06 Marks)

- c. Compute the real root of  $x \log_{10} x - 1.2 = 0$  by the method of false position. Carry out 3 iterations in (2, 3). (06 Marks)

**OR**

- 6 a. Fit a second degree parabola to the following data  $y = a + bx + cx^2$ .

x :	1	1.5	2	2.5	3	3.5	4
y :	1.1	1.3	1.6	2	2.7	3.4	4.1

(08 Marks)

- b. If  $\theta$  is the angle between two regression lines, show that

$$\tan \theta = \left| \frac{1-r^2}{r} \right| \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}; \text{ explain significance of } r=0 \text{ and } r=\pm 1. \quad (06 \text{ Marks})$$

- c. Using Newton Raphson method, find the real root of the equation  $3x = \cos x + 1$  near  $x_0 = 0.5$ . Carry out 3 iterations. (06 Marks)

**Module-4**

- 7 a. From the following table, estimate the number of students who obtained marks between 40 and 45.

Marks	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of students	31	42	51	35	31

(08 Marks)

- b. Use Newton's dividend formula to find  $f(9)$  for the data.

x :	5	7	11	13	17
f(x) :	150	392	1452	2366	5202

(06 Marks)

- c. Find the approximate value of  $\int_0^{\pi/2} \sqrt{\cos \theta} d\theta$  by Simpson's  $\frac{1}{3}$ rd rule by dividing  $\left[0, \frac{\pi}{2}\right]$  into 6 equal parts. (06 Marks)

**OR**

- 8 a. The area A of a circle of diameter d is given for the following values:

d :	80	85	90	95	100
a :	5026	5674	6362	7088	7854

Calculate the area of circle of diameter 105 by Newton's backward formula. (08 Marks)

- b. Using Lagrange's interpolation formula to find the polynomial which passes through the points (0, -12), (1, 0), (3, 6), (4, 12). (06 Marks)

- c. Evaluate  $\int_1^{52} \log_e x dx$  taking 6 equal parts by applying Weddle's rule. (06 Marks)

Module-5

- 9 a. If  $\vec{F} = 3xy\hat{i} - y^2\hat{j}$ , evaluate  $\int_C \vec{F} \cdot d\vec{r}$  where 'C' is arc of parabola  $y = 2x^2$  from  $(0, 0)$  to  $(1, 2)$  (08 Marks)
- b. Evaluate by Stokes theorem  $\oint_C (\sin x dx - \cos x dy + \sin y dz)$ , where C is the boundary of the rectangle  $0 \leq x \leq \pi$  ;  $0 \leq y \leq 1, z = 3$  (06 Marks)
- c. Prove that the necessary condition for the  $I = \int_{x_1}^{x_2} f(x, y, y) dx$  to be extremum is  $\frac{\partial f}{\partial y} - \frac{d}{dx} \left( \frac{\partial f}{\partial y'} \right) = 0$  (06 Marks)
- OR
- 10 a. Using Green's theorem evaluate  $\int_C (3x^2 - 2y^2) dx + (4y - 6xy) dy$ , where C is the boundary of the region bounded by the lines  $x = 0, y = 0, x + y = 1$ . (08 Marks)
- b. Find the external value of  $\int_0^{\pi/2} [(y')^2 - y + 4y \cos x] dx$ . Given that  $y(0) = 0, y\left(\frac{\pi}{2}\right) = 0$ . (06 Marks)
- c. Prove that the shortest distance between two points in a plane is along a straight line joining them. (06 Marks)

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17MATDIP31

## Third Semester B.E. Degree Examination, June/July 2019 Additional Mathematics - I

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 sine of the angle between  $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$  and  $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$ . (08 Marks)
- b. Express the complex number  $\frac{(1+i)(1+3i)}{1+5i}$  in the form  $a + ib$ . (06 Marks)
- c. Find the modulus and amplitude of  $\frac{(1+i)^2}{3+i}$ . (06 Marks)

OR

- 2 a. Show that  $(1 + \cos\theta + i \sin\theta)^n + (1 + \cos\theta - i \sin\theta)^n = 2^{n+1} \cdot \cos^n\left(\frac{\theta}{2}\right) \cdot \cos\left(\frac{n\theta}{2}\right)$ . (08 Marks)
- b. If  $\vec{a} = 2\hat{i} + 3\hat{j} - 4\hat{k}$  and  $\vec{b} = 3\hat{i} - 4\hat{j} + \hat{k}$ , then prove that  $\vec{a}$  is perpendicular to  $\vec{b}$ . Also find  $|\vec{a} \times \vec{b}|$ . (06 Marks)
- c. Determine  $\lambda$  such that  $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ ,  $\vec{b} = 2\hat{i} - 4\hat{k}$  and  $\vec{c} = \hat{i} + \lambda\hat{j} + 3\hat{k}$  are coplanar. (06 Marks)

### Module-2

- 3 a. If  $y = \cos(m \log x)$  then prove that  $x^2 y_{n+2} + (2n+1)xy_{n+1} + (m^2 + n^2)y_n = 0$ . (08 Marks)
- b. Find the angle of intersection of the curves  $r^2 \sin 2\theta = a^2$  and  $r^2 \cos 2\theta = b^2$ . (06 Marks)
- c. Find the pedal equation of the curve  $r = a(1 + \sin\theta)$ . (06 Marks)

OR

- 4 a. Obtain the Maclaurin's series expansion of  $\log \sec x$  up to the terms containing  $x^6$ . (08 Marks)
- b. If  $u = \operatorname{cosec}^{-1}\left(\frac{x^2 + y^2}{x^3 + y^3}\right)$ , prove that  $xu_x + yu_y = -\frac{1}{6} \tan u$ . (06 Marks)
- c. Find  $\frac{\partial(u, v, w)}{\partial(x, y, z)}$  where  $u = x + y + z$ ,  $v = y + z$ ,  $w = z$ . (06 Marks)

### Module-3

- 5 a. Obtain a reduction formula for  $\int_0^{\pi/2} \sin^n x dx$ , ( $n > 0$ ). (08 Marks)
- b. Evaluate  $\int_0^{2a} x^2 \sqrt{2ax - x^2} dx$ . (06 Marks)
- c. Evaluate  $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$  (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. Evaluate  $\int_0^a \int_0^{x+y} \int_0^{x+y} e^{x+y+z} dz dy dx$ . (08 Marks)
- b. Evaluate  $\int_0^{\infty} \frac{x^6}{(1+x^2)^{9/2}} dx$ . (06 Marks)
- c. Evaluate  $\iint_A xy dx dy$  where A is the area bounded by the circle  $x^2 + y^2 = a^2$  in the first quadrant. (06 Marks)

Module-4

- 7 a. A particle moves along the curve  $\vec{r} = \cos 2t \hat{i} + \sin 2t \hat{j} + t \hat{k}$ . Find the components of velocity and acceleration at  $t = \frac{\pi}{6}$  along  $\sqrt{2} \hat{i} + \sqrt{2} \hat{j} + \hat{k}$ . (08 Marks)
- b. Find divergence and curl of the vector  $\vec{F} = (xyz + y^2z) \hat{i} + (3x^2 + y^2z) \hat{j} + (xz^2 - y^2z) \hat{k}$ . (06 Marks)
- c. Find the directional derivative of  $\phi = x^2 y z^3$  at (1, 1, 1) in the direction of  $\hat{i} + \hat{j} + 2\hat{k}$ . (06 Marks)

OR

- 8 a. Find the angle between the tangents to the curve  $x = t^2, y = t^3, z = t^4$  at  $t = 2$  and  $t = 3$ . (08 Marks)
- b. Find  $\text{curl}(\text{curl } \vec{A})$  where  $\vec{A} = xy \hat{i} + y^2 z \hat{j} + z^2 y \hat{k}$ . (06 Marks)
- c. Find the constants a, b, c such that the vector field  $(\sin y + az) \hat{i} + (bx \cos y + z) \hat{j} + (x + cy) \hat{k}$  is irrotational. (06 Marks)

Module-5

- 9 a. Solve  $\frac{dy}{dx} = \frac{y}{x} + \sin\left(\frac{y}{x}\right)$ . (08 Marks)
- b. Solve  $\frac{dy}{dx} + y \cot x = \sin x$ . (06 Marks)
- c. Solve  $\frac{dy}{dx} + \frac{y}{x} = y^2 x$ . (06 Marks)

OR

- 10 a. Solve  $x^2 y dx - (x^3 + y^3) dy = 0$ . (08 Marks)
- b. Solve  $x^2 \frac{dy}{dx} = 3x^2 - 2xy + 1$ . (06 Marks)
- c. Solve  $\left[ y \left( 1 + \frac{1}{x} \right) + \cos y \right] dx + [x + \log x - x \sin y] dy = 0$ . (06 Marks)

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17CV33

## Third Semester B.E. Degree Examination, June/July 2019 Fluid Mechanics

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 following with symbols and units :
  - i) Weight density
  - ii) Specific volume
  - iii) Density. (06 Marks)
- b. What do you mean by single column manometer? Derive the expression for vertical single column manometer. (06 Marks)
- c. The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe which a fluid of sp.gr. 0.9 is flowing. The centre of the pipe is 12cm below the level of the mercury in the right limb. Find the pressure of fluid in the pipe. If difference of mercury level in the two limb is 20cm. (08 Marks)

**OR**

- 2 a. What is capillarity? Derive an expression for capillarity rise for a liquid in a glass tube. (06 Marks)
- b. Explain difference between i) absolute and gauge pressure ii) Newtonian and non Newtonian iii) ideal fluid and real fluid iv) simple manometer and differential manometer. (08 Marks)
- c. Calculate pressure due to a column of 0.4 of i) water ii) an oil of sp.gr 0.9 and iii) mercury of sp.gr 13.6. Take density water  $\rho = 1000 \text{ kg/m}^3$ . (06 Marks)

### Module-2

- 3 a. Derive an expression for total pressure and centre of pressure of a inclined plane surface immersed in a liquid. (08 Marks)
- b. Determine the total pressure and depth of centre of pressure on a plane rectangular surface of 1m wide and 3m deep when its upper edge is horizontal and i) coincides with water surface ii) 2m below the free water surface. (06 Marks)
- c. A circular plate 3m diameter is immersed in water in such way that its greatest and least depth below the free surface are 4m and 1.5m respectively. Determine the total pressure on one face of the plate and position of centre of pressure. (06 Marks)

**OR**

- 4 a. Define :
  - i) Uniform and non-uniform flow
  - ii) Rotational and irrotational flow
  - iii) Stream line and path line
  - iv) Laminar and turbulent flow. (08 Marks)
- b. Derive the three dimensional continuity equation in the Cartesian coordinates. (06 Marks)
- c. A 40cm diameter pipe, conveying water, branches into two pipes of diameter 30cm and 20cm respectively. If the average velocity in the 40cm pipe is 3m/sec. Find the discharge in the pipe. Also determine velocity in 20cm pipe if the average velocity in 30cm diameter pipe is 2m/sec. (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.

**Module-3**

- 5 a. Derive an expression for Bernoulli's equation and state the assumption made for such a derivation. (06 Marks)
- b. What is venturimeter? Derive an expression for the discharge through venturimeter. (08 Marks)
- c. Water flowing through a pipe having diameter 30cm and 15cm at the bottom and upper end respectively. The intensity of pressure at the bottom end is  $29.43\text{N/cm}^2$  and pressure at the upper end is  $14.715\text{N/cm}^2$ . Determine the difference datum head if the rate of flow through the pipe is 50lit/sec. (06 Marks)

OR

- 6 a. Define the terms : i) Free vortex ii) Forced vortex (04 Marks)
- b. State the momentum equation. How will you apply the momentum equation for determining the force exerted by flowing liquid on a bend? (08 Marks)
- c. 250 lit/sec of water is flowing in a pipe having diameter of 300mm. If the pipe is bent by  $135^\circ$  (i.e changes from initial to final direction is  $135^\circ$ ). Find the magnitude and direction on of the resultant force on the bend. The pressure of water flowing is  $39.24\text{N/cm}^2$ . (08 Marks)

**Module-4**

- 7 a. Prove that the discharge over triangular notch is  $Q = \frac{8}{15} cd\sqrt{2g} \tan\theta / 2H^{3/2}$ . (08 Marks)
- b. Explain the experimental determination of hydraulic coefficients  $C_d$ ,  $C_v$  and  $C_c$ . (06 Marks)
- c. The head of water over an orifice of diameter 100mm is 5m. The water coming out from the orifice is collected in a circular tank of diameter 2m. The rise of water level in this tank is 0.45m in 30Sec. Also coordinates of certain point of jet, measured by venacontracts are 100cm horizontal and 5.2cm vertical. Find the hydraulic coefficients  $C_d$ ,  $C_v$  and  $C_c$ . (06 Marks)

OR

- 8 a. Distinguish between : i) Notch and Weir ii) Orifice and mouthpiece. (04 Marks)
- b. What is cipolletti weir? Prove that the discharge through cipolletti Weir is given by  $Q = \frac{2}{3} cd\sqrt{2g} H^{3/2}$ . (08 Marks)
- c. The water flowing in a rectangular channel of 1.2m wide and 0.8m deep. Find the discharge over the rectangular Weir of the crest length 70cm. If the head of water over the crest of weir is 25cm and water from channel flows over the weir. Take  $C_d = 0.60$  Neglect end contraction but consider velocity of approach. (08 Marks)

**Module-5**

- 9 a. Explain the terms with neat sketch : i) Pipes in parallel ii) Pipes in series iii) Hydraulic gradient line iv) Total energy line. (08 Marks)
- b. Three pipes of length 800m, 500m and 400m and of diameter 500mm, 400mm and 300mm respectively are connected by a single pipe of length 1700m. Find the diameter of the single pipe. (06 Marks)
- c. Find the diameter of the pipe of length 2500m when the rate of flow of water through the pipe is  $0.25\text{m}^3/\text{sec}$  and head loss due to friction is 5m. Take  $C = 50$  in Chezy's formula. (06 Marks)

OR

- 10 a. What do you mean by equivalent pipe? Obtain an expression for equivalent pipe. (08 Marks)
- b. Derive expression for the loss of head due to sudden expansion in the pipe. (08 Marks)
- c. Find the loss of head when pipe of diameter 200mm is suddenly enlarged to a diameter of 400mm. The rate of flow of water through the pipe is 250lit/sec. (04 Marks)

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## Third Semester B.E. Degree Examination, June/July 2019 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. Explain fundamental principles of surveying. (06 Marks)  
 b. Differentiate between (i) Plan and map (ii) Accuracy and Precision. (06 Marks)  
 c. A survey line BAC crosses a river, A and C being on the near and distant banks respectively. Standing at D, a point 100 meters measured perpendicular to AB from A, the bearing of C and B are  $230^\circ$  respectively, AB being 50 meters. Find the width of the river. (08 Marks)

OR

- 2 a. Define surveying. Briefly explain the classification of surveying (08 Marks)  
 b. Explain the methods of chaining on sloping ground. (04 Marks)  
 c. A steel tape 30 meters long standardizing at  $60^\circ\text{F}$  with a pull of 10 kg and was used in measuring a baseline. Find the correction per tape length if the temperature at the time of measurement was  $85^\circ\text{F}$  and pull exerted was 16 kg. Weight of 1 centimeter cube of steel is 7.86 grams and total weight of tape is 0.8 kg.  $E = 2.1 \times 10^6 \text{ kg/cm}^2$  and co-efficient of expansion of tape per  $1^\circ\text{F} = 6.2 \times 10^{-6}$ . (08 Marks)

### Module-2

- 3 a. Differentiate between (i) Fore bearing and back bearing (ii) Magnetic bearing and True bearing (iii) Magnetic declination and magnetic dip. (06 Marks)  
 b. Explain the uses of theodolite. (06 Marks)  
 c. Determine the included angles in a closed traverse ABCDA conducted in a clockwise direction, given the following bearing observed with a prismatic compass.

Line	AB	BC	CD	DA
Fore bearing	$40^\circ$	$70^\circ$	$210^\circ$	$280^\circ$

Apply check.

(08 Marks)

OR

- 4 a. What are the different methods of measuring horizontal angle using theodolite? Explain any one in detail. (10 Marks)  
 b. Following bearing were observed with a prismatic compass.

Line	AB	BC	CD	DE	EA
Fore bearing	$74^\circ 0'$	$91^\circ 0'$	$166^\circ 0'$	$177^\circ 0'$	$289^\circ 0'$
Back bearing	$254^\circ 0'$	$271^\circ 0'$	$343^\circ 0'$	$0^\circ 0'$	$109^\circ 0'$

Where do you suspect the local attraction? Find the correct bearings.

(10 Marks)

### Module-3

- 5 a. Derive distance and elevation formulae for stadia tachometry, when staff held normal to the line of sight, for both an angle of elevation and an angle of depression. (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. The following data is available for a closed traverse ABCDA. Determine closing error and adjust the traverse using transit rule. Take co-ordinates of A(200, 100), compute coordinates of all the stations.

Line	AB	BC	CD	DA
Length (m)	250	123	256	108
Bearing	86° 42'	178° 06'	270° 0'	2° 0'

(12 Marks)

OR

- 6 a. What are the different methods of balancing the traverse? Explain them. (08 Marks)  
 b. A tachometer is set up at an intermediate point on a traverse course PQ and following observations are made on a vertically held staff.

Staff Station	Vertical angle	Staff intercept	Axial hair readings.
P	+ 8° 36'	2.350	2.105
Q	+ 6° 06'	2.055	1.895

The instrument is fitted with annalistic lens and the constant is 100. Compute the length of PQ and reduced level of Q, that of P being 321.50 meters. (12 Marks)

**Module-4**

- 7 a. Explain temporary adjustments of a dumpy level. (06 Marks)  
 b. Define the following terms: (i) Bench mark (ii) Back sight (iii) Reduced level (iv) Datum. (04 Marks)  
 c. The following staff readings were observed successively with a level, the instrument have been moved forward after the second, fourth and eighth readings.  
 0.875, 1.235, 2.310, 1.385, 2.930, 3.125, 4.125, 0.120, 1.875, 2.030, 3.765.  
 The first reading was taken with the staff held upon a bench mark of elevation 132.135m. Enter the readings in a page of level book and reduce the levels. Apply the usual check. (10 Marks)

OR

- 8 a. Compare rise and fall method of reducing levels with the height of collimation method. (06 Marks)  
 b. The following consecutive readings were taken with a level and 5 meter leveling staff on a continuously sloping ground at common interval of 20 meters.  
 0.585, 1.830, 1.925, 2.825, 3.730, 4.685, 0.825, 2.005, 3.110, 4.485.  
 The reduced level of first point was 218.125m. Rule out a page of level book and enter the above readings. Calculate the reduced level of points by rise and fall method and also gradient of the line joining first and last point. (14 Marks)

**Module-5**

- 9 a. What are the different methods of contouring? Discuss the merits and demerits of each. (08 Marks)  
 b. The following give the values in meters of the offsets taken from a chain line to an irregular boundary calculate the area included between the chain line and irregular boundary and first and last offsets by (i) Simpson rule (ii) Trapezoidal rule.

Distance in m	0	50	100	150	200	250	300	350	400
Off sets in m	10.6	15.4	20.2	18.7	16.4	20.8	22.4	19.3	17.6

(12 Marks)



OR

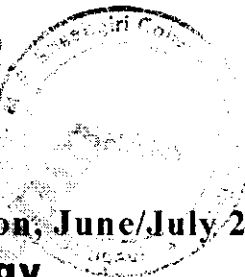
- 10 a. What are the different characteristics of contour lines? Explain with neat sketches. (06 Marks)
- b. Discuss the different methods of determining areas. (04 Marks)
- Calculate the volume of earth work by prismoidal rule in a road embankment with following data:

Chainage along centre line	0	100	200	300	400
Ground level	201.700	202.900	202.400	204.700	205.900

Formation level at chainage 0 is 203.300m, top width is 12.0 meters, side slope is 2 to 1 and longitudinal gradient is 1 in 100. The ground is level across the centre line. (10 Marks)

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17CV/CT35

## Third Semester B.E. Degree Examination, June/July 2019 Engineering Geology

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Write sketches wherever required.

### Module-1

- 1 a. Explain major shells of the Earth interior with reference to its composition and density. (10 Marks)  
b. Explain important 'light dependent' physical properties of minerals with examples. (06 Marks)  
c. What are Rock forming and Ore forming minerals and give two examples each. (04 Marks)

OR

- 2 a. Briefly explain : i) STAL and SIMA ii) Discontinuities in earth's interior. (06 Marks)  
b. Write a note on application of geology in civil engineering projects. (08 Marks)  
c. Describe important physical properties and engineering uses of following minerals :  
i) Gypsum ii) Bauxite. (06 Marks)

### Module-2

- 3 a. What are sedimentary rock? Explain its classification based on grain size of sediments giving example. (08 Marks)  
b. Explain broad classification of igneous rocks giving examples relevant to construction material. (06 Marks)  
c. Explain the properties and engineering uses of any one rock from each group :  
i) Elastic sedimentary Rock ii) Metamorphic Rocks. (06 Marks)

OR

- 4 a. Explain the formation of folds and joints and add a note on their importance in civil engineering. (06 Marks)  
b. Explain geological consideration of selection of dam site on inclined and faulted rocks. (08 Marks)  
c. Explain i) Deformation of rocks ii) Rock Quality Designation (RQD). (06 Marks)

### Module-3

- 5 a. What is Weathering? Briefly explain mechanical weathering. (06 Marks)  
b. Write a note on Watershed management. (04 Marks)  
c. What is an Earthquake? Discuss causes, effects and mechanism. (10 Marks)

OR

- 6 a. Briefly explain geological work of running water and its importance in civil engineering. (08 Marks)  
b. Write a note on seismic resistant structures. (06 Marks)  
c. Explain i) Drainage pattern ii) Reservoir induced Seismicity. (06 Marks)

### Module-4

- 7 a. What is an Aquifer? With neat sketch, explain its types. (06 Marks)  
b. Explain Electrical resistivity method with resistivity curves for ground water exploration. (10 Marks)  
c. Write a note on Ground water pollution. (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.

OR

- 8 a. Explain Seismic method to understand subsurface geology. (06 Marks)  
b. Describe various method of artificial recharging of ground water. (10 Marks)  
c. Write a note on sea water intrusion and remedial measure. (04 Marks)

**Module-5**

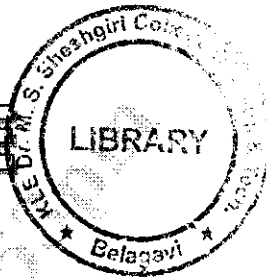
- 9 a. What is Remote sensing? Write its principle and list important applications in civil engineering. (10 Marks)  
b. What are Toposheets and geological maps? Add a note on their uses in civil engineering. (06 Marks)  
c. What is disaster and explain its types. (04 Marks)

OR

- 10 a. What is Global positioning system? Explain its concept and application in civil engineering. (10 Marks)  
b. Explain : i) Impact of mining on environment ii) LANDSAT imageries. (10 Marks)

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17MAT41

## Fourth Semester B.E. Degree Examination, June/July 2019 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. If  $y' + y + 2x = 0$ ,  $y(0) = -1$  then find  $y(0.1)$  by using Taylor's series method. Consider upto third order derivative term. (06 Marks)
- b. Find  $y(0.2)$  by using modified Euler's method, given that  $y' = x + y$ ,  $y(0) = 1$ . Take  $h = 0.1$  and carry out two modifications at each step. (07 Marks)
- c. If  $y' = \frac{1}{x+y}$ ,  $y(0) = 2$ ,  $y(0.2) = 2.0933$ ,  $y(0.4) = 2.1755$ ,  $y(0.6) = 2.2493$  then find  $y(0.8)$  by Milne's method. (07 Marks)

**OR**

- 2 a. Use Taylor's series method to find  $y(0.1)$  from  $y' = 3x + y^2$ ,  $y(0) = 1$ . Consider upto fourth derivative term. (06 Marks)
- b. Use Runge - Kutta method to find  $y(0.1)$  from  $y' = x^2 + y$ ,  $y(0) = -1$ . (07 Marks)
- c. Use Adam - Bashforth method to find  $y(0.4)$  from  $y' = \frac{1}{2}xy$ ,  $y(0) = 1$ ,  $y(0.1) = 1.0025$ ,  $y(0.2) = 1.0101$ ,  $y(0.3) = 1.0228$ . (07 Marks)

### Module-2

- 3 a. Express  $x^3 - 5x^2 + 6x + 1$  in terms of Legendre polynomials. (06 Marks)
- b. Find  $y(0.1)$ , by using Runge - Kutta method, given that  $y'' + xy' + y = 0$ ,  $y(0) = 1$ ,  $y'(0) = 0$ . (07 Marks)
- c. Solve Bessel's operation leading to  $J_n(x)$ . (07 Marks)

**OR**

- 4 a. Prove that  $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ . (06 Marks)
- b. Find  $y(0.4)$  by using Milne's method, given that  $y(0) = 1$ ,  $y'(0) = 1$ ,  $y(0.1) = 1.0998$ ,  $y'(0.1) = 0.9946$ ,  $y(0.2) = 1.1987$ ,  $y'(0.2) = 0.9773$ ,  $y(0.3) = 1.2955$ ,  $y'(0.3) = 0.946$ . (07 Marks)
- c. State and prove Rodrigue's formula. (07 Marks)

### Module-3

- 5 a. Derive Cauchy - Riemann equations in Cartesian coordinates. (06 Marks)
- b. Find an analytic function  $f(z) = u + iv$  in terms of  $z$ , given that  $u = e^{2x}(x \cos 2y - y \sin 2y)$ . (07 Marks)
- c. Evaluate  $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$ ,  $c$  is  $|z| = 3$  by residue theorem. (07 Marks)

**OR**

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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.

- 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. Discuss the transformation  $W = Z^2$ . (07 Marks)
- c. Find a bilinear transformation that maps the points  $\infty, i, 0$  in  $Z$ -plane into  $-1, -i, 1$  in  $W$ -plane respectively. (07 Marks)

**Module-4**

- 7 a. In a sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2, out of 1000 such samples, how many would be expected to contain atleast 3 defective parts? (06 Marks)
- b. If  $X$  is a normal variate with mean 30 and standard deviation 5, find the probabilities that  
 i)  $26 \leq X \leq 40$  ii)  $X > 45$  iii)  $|X - 30| > 5$   
 Given that  $\phi(0.8) = 0.288$ ,  $\phi(2.0) = 0.4772$ ,  $\phi(3) = 0.4987$ ,  $\phi(1) = 0.3413$ . (07 Marks)
- c. The joint density function of two continuous random variables  $X$  and  $Y$  is given by
- $$f(x, y) = \begin{cases} Kxy, & 0 \leq x \leq 4, 1 < y < 5 \\ 0, & \text{otherwise} \end{cases}$$
- Find i)  $K$  ii)  $E(x)$  iii)  $E(2x + 3y)$ . (07 Marks)

**OR**

- 8 a. Derive mean and standard deviation of the Poisson distribution. (06 Marks)
- b. The joint probability distribution for two random variables  $X$  and  $Y$  as follows :

$X \backslash Y$	-2	-1	4	5
1	0.1	0.2	0	0.3
2	0.2	0.1	0.3	0

- Find i) Expectations of  $X, Y, XY$  ii) SD of  $X$  and  $Y$  iii) Covariance of  $X, Y$   
 iv) Correlation of  $X$  and  $Y$ . (07 Marks)
- c. In a certain town the duration of shower has mean 5 minutes. What is the probability that shower will last for i) 10 minutes or more ii) Less than 10 minutes iii) Between 10 and 12 minutes. (07 Marks)

**Module-5**

- 9 a. A group of boys and girls were given in Intelligence test. The mean score, SD score and numbers in each group are as follows : (06 Marks)

	Boys	Girls
Mean	74	70
SD	8	10
$X$	12	10

Is the difference between the means of the two groups significant at 5% level of significance? Given that  $t_{0.05} = 2.086$  for 20 d.f.

- b. The following table gives the number of accidents that take place in an industry during various days of the week. Test if accidents are uniformly distributed over the week.

Day	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents	14	18	12	11	15	14

Given that  $X^2 = 11.09$  at 5% level for 5 d.f. (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 following terms :

- i) Type I error and type II error.
- ii) Transient state.
- iii) Absorbing state.

(06 Marks)

- b. A certain stimulus administered to each of the 12 patients resulted in the following increases of blood pressure -5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will be general be accompanied by an increase in blood pressure. Given that  $t_{0.05} = 2.2$  for 11 d.f.

(07 Marks)

- c. If  $P = \begin{bmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{bmatrix}$ . Find the corresponding stationary probability vector. (07 Marks)

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17MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2019

## 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  $\begin{bmatrix} 2 & 3 & 4 \\ -1 & 2 & 3 \\ 1 & 5 & 7 \end{bmatrix}$  by elementary row operations. (08 Marks)
- b. Test for consistency and solve  $x + y + z = 6$ ,  $x - y + 2z = 5$ ,  $3x + y + z = 8$ . (06 Marks)
- c. Solve the system of equations by Gauss elimination method : (06 Marks)
- $$\begin{matrix} x + y + z = 9 & x - 2y + 3z = 8 & 2x + y - z = 3 \end{matrix}$$

OR

- 2 a. Find all the eigen values and the corresponding eigen vectors of the matrix  $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$  (08 Marks)
- b. Solve by Gauss elimination method  $x_1 - 2x_2 + 3x_3 = 2$ ,  $3x_1 - x_2 + 4x_3 = 4$ ,  $2x_1 + x_2 - 2x_3 = 5$ . (06 Marks)
- c. If  $A = \begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$  find  $A^{-1}$  by Cayley Hamilton theorem. (06 Marks)

### Module-2

- 3 a. Solve  $\frac{d^3y}{dx^3} - 2\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 8y = 0$ . (08 Marks)
- b. Solve  $6\frac{d^2y}{dx^2} + 17\frac{dy}{dx} + 12y = e^{-x}$ . (06 Marks)
- c. Solve  $y'' - 4y' + 13y = \cos 2x$ . (06 Marks)

OR

- 4 a. Solve  $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$  (08 Marks)
- b. Solve  $y'' + 2y' + y = \frac{e^{2x} + e^{-3x}}{2}$  (06 Marks)
- c. Solve  $y'' + 2y' + y = 2x + x^2$ . (06 Marks)

### Module-3

- 5 a. Find  $L[\cosh at]$ . (08 Marks)
- b. Find  $L[e^{-2t} \sinh 4t]$  (06 Marks)
- c. Find  $R\{t \sin 2t\}$ . (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. Show that  $\int_0^{\infty} t^3 e^{-st} \sin t dt = 0$ . (08 Marks)
- b. If  $f(t) = t^2$ ,  $0 < t < 2$  and  $f(t+2) = f(t)$  for  $t > 2$ , find  $L[f(t)]$ . (06 Marks)
- c. Express  $f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$  in terms of unit step function and hence find their Laplace Transforms. (06 Marks)

Module-4

- 7 a. Find the inverse Laplace Transform of  $\frac{3}{s^2} + \frac{2e^{-s}}{s^3} - \frac{3e^{-2s}}{s}$ . (08 Marks)
- b. Find  $L^{-1}\left[\frac{s^3 + 6s^2 + 12s + 8}{s^6}\right]$ . (06 Marks)
- c. Find the inverse Laplace Transform of  $\frac{s+5}{s^2 - 6s + 13}$ . (06 Marks)
- 8 a. Solve by using Laplace Transform.  $\frac{d^2y}{dt^2} + k^2y = 0$ , given that  $y(0) = 2$ ,  $y'(0) = 0$ . (08 Marks)
- b. Find inverse Laplace Transform of  $\frac{1}{(s+1)(s+2)(s+3)}$ . (06 Marks)
- c. Find  $L^{-1}\left[\frac{s+1}{s^2 + 6s + 9}\right]$ . (06 Marks)

Module-5

- 9 a. Find the probability that a leap year selected at random will contain 53 Sundays. (08 Marks)
- b. A six faced die on which the numbers 1 to 6 are marked is thrown. Find the probability of (i) 3 (ii) an odd number coming up. (06 Marks)
- c. State and prove Bayes's theorem. (06 Marks)

OR

- 10 a. A problem is given to three students A, B, C whose chances of solving it are  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$  respectively. Find the probability that the problem is solved. (08 Marks)
- b. For any three events A, B, C, prove that  $P\{(A \cup B)/C\} = P(A/C) + P(B/C) - P\{(A \cap B)/C\}$ . (06 Marks)
- c. Three machines A, B and C produce respectively 60%, 30% and 10% of the total number of items of a factory. The percentages of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine C. (06 Marks)

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17CV42

**Fourth Semester B.E. Degree Examination, June/July 2019**  
**Analysis of Determinate Structures**

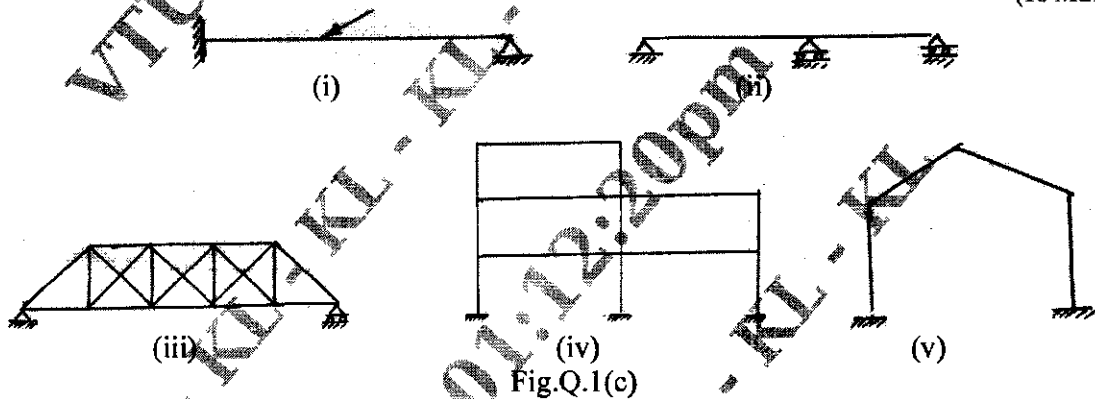
Time: 3 hrs.

Max. Marks: 100

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

Module-1

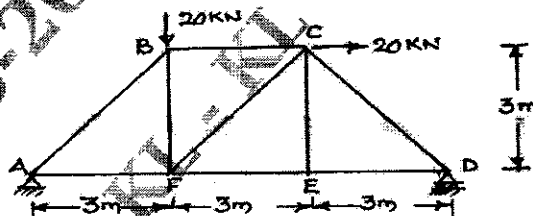
- 1 a. Differentiate between statically determinate and indeterminate beams with an example for each. (06 Marks)
- b. Define degree of freedom. What is the degree of freedom for a i) Fixed support (04 Marks)  
 ii) Hinged support
- c. Determine static and kinematic indeterminacy for the following shown in Fig.Q.1(c). (10 Marks)



OR

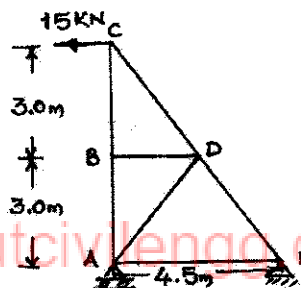
- 2 a. Determine the forces in all the members of the truss shown in Fig.Q.2(a) use the method of joints. (12 Marks)

Fig.Q.2(a)



- b. Determine the forces in all the members of the truss shown in Fig.Q.2(b) by the method of section. (08 Marks)

Fig.Q.2(b)



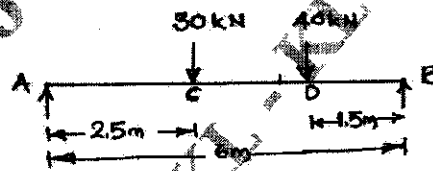
Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-2**

- 3 a. Derive moment curvature equation for deflection. (04 Marks)  
 b. Determine the slope and deflection at free end of a cantilever beam subjected to point load 'W' at free end and of span 'L' with constant EI use Maculay's method. (08 Marks)  
 c. Using Conjugate beam method Determine the maximum deflection and slopes at support for a simply supported beam subjected to udl of  $w$  run over a span of L m with constant EI. (08 Marks)

OR

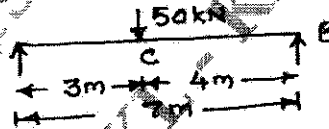
- 4 a. Determine the slope at left support and deflection at mid span of simply supported beam subjected to the loads as shown in Fig.Q.4(a) by using Maculay's method take  $EI = 200\text{MN}\cdot\text{m}^2$ . (10 Marks)  
 b. Determine the slope at A and deflection at mid span for the above beam shown in Fig.Q.4(b) by using moment area method  $EI = 200\text{MN}\cdot\text{m}^2$ . (10 Marks)

**Module-3**

- 5 a. Obtain an expression for strain energy stored in a member when it is subjected to bending moment. (06 Marks)  
 b. Find the deflection at C due to a point load acting as shown in Fig.Q.5(b) by using strain energy method. (06 Marks)

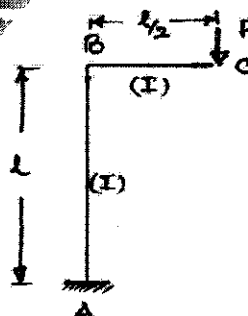


- c. Find the deflection under the concentrated load for the beam shown in Fig.Q.5(c), by using Castiglino's theorem. Take  $E = 2 \times 10^8\text{ kN/m}^2$  and  $I = 14 \times 10^6\text{ m}^4$ . (08 Marks)



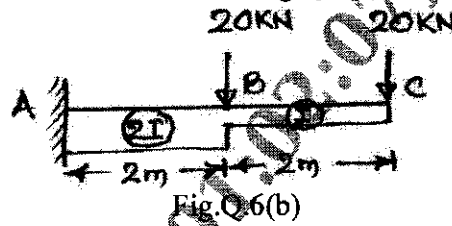
OR

- 6 a. Determine the horizontal and vertical deflection at the free end of bracket shown in Fig.Q.6(a). (10 Marks)





- b. Determine the slope and deflection at free end of cantilever by using unit load method take  $E = 2 \times 10^5 \text{ N/mm}^2$  and  $I = 12 \times 10^6 \text{ mm}^4$  Refer Fig.Q.6(b) (10 Marks)



**Module-4**

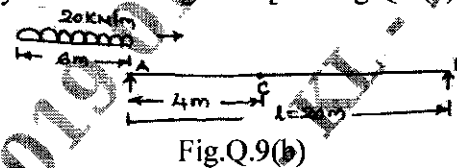
- 7 a. A three hinged parabolic arch of span 20m and rise 4m carries a udl of 20kN/m run on the left half of the span find the maximum BM for the arch and also determine normal thrust and radial shear at a point 5m from left support. (10 Marks)
- b. Show that the shape of cable is parabolic when the supports are at the same level and is subjected to udl of  $w$  force/unit length over the entire span also find the length of the cable. (10 Marks)

OR

- 8 a. A cable of span 20m and central dip 4m carries a udl of 20kN/m over the whole span. Find: i) Maximum tension in the cable ii) Minimum tension in the cable iii) Length of cable iv) Horizontal and vertical forces transmitted on to the supporting pier if the cable passed over a smooth frictionless pulley. (10 Marks)
- b. Show that the parabolic shape is a funicular shape for a three hinged arch subjected to udl over its entire span. (10 Marks)

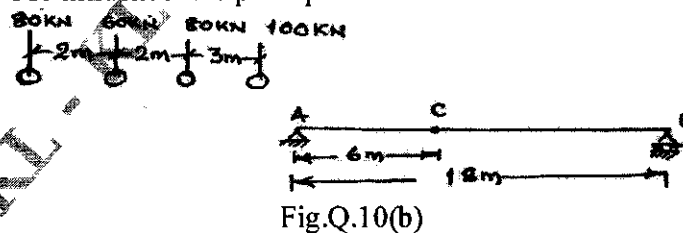
**Module-5**

- 9 a. Define influence line diagram, what are the uses of I.L.D? (04 Marks)
- b. A simple girder of 20m span is traversed by a moving udl of length 6m with an intensity of 20kN/m from left to right. Find the maximum bending moment and maximum positive and negative shear force at section 4m from left support also find the absolute maximum bending moment that may occur any where in the girder. [Ref.Fig.Q.9(b)] (16 Marks)



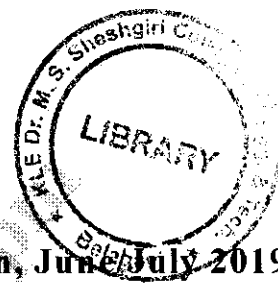
OR

- 10 a. Draw the unit load influence line diagrams for the reactions at supports of a simply supported beam. (04 Marks)
- b. A simply supported beam shown in Fig.Q.10(b) is subjected a set of four concentrated loads which move from left to right. Determine: i) Maximum bending moment and shear force at a section of 6m from left support ii) Absolute maximum shear force and absolute maximum bending moment. Use influence line principle. (16 Marks)



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# CBCS SCHEME



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## Fourth Semester B.E. Degree Examination, June/July 2019 Applied Hydraulics

Time: 3 hrs.

Max. Marks: 100

**Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data may suitably be assumed.

### Module-1

- 1 a. Explain Dimensionally Homogeneous equation. Give any two examples. (10 Marks)  
b. Using Buckingham's  $\pi$  - theorem, show that the velocity through a circular orifice is given by  $V = \sqrt{2gH} \phi \left[ \frac{D}{H}, \frac{\mu}{\rho V H} \right]$ , where H is head causing flow,  $\mu$  is coefficient viscosity,  $\rho$  = mass density and  $g$  = gravitational acceleration. (10 Marks)

OR

- 2 a. Derive an expression for kinematic and dynamic similarities. (04 Marks)  
b. In the model test of a spillway the discharge and velocity of flow over the model were  $2\text{m}^3/\text{s}$  and  $1.53\text{ m/s}$  respectively. Calculate the velocity and discharge over the prototype which is 36 times the model size. (08 Marks)  
c. A solid cylinder 2m in diameter and 2m high is floating in water with its axis vertical. If the specific gravity of the material of cylinder is 0.65, find its metacentric height. State also whether the equilibrium is stable or unstable. (08 Marks)

### Module-2

- 3 a. Explain various types of flows in channel. (10 Marks)  
b. A canal of trapezoidal section has bed width of 8m and bed slope of 1 in 4000. If the depth of flow is 2.4m and side slopes of the channel are 1H to 3V, then determine the average velocity and the discharge carried by the channel. Also compute the average shear stress at the channel boundary. Take  $C = 56$ . (10 Marks)

OR

- 4 a. Obtain the conditions of most economical trapezoidal section in which side slope is constant. (10 Marks)  
b. A 8m wide channel conveys  $15\text{m}^3/\text{s}$  of water at a depth of 1.2m. Obtain the following :  
i) Specific energy of the flowing water.  
ii) Critical depth, Critical velocity, and minimum specific energy.  
iii) Froude number and state whether flow is subcritical or supercritical. (10 Marks)

### Module-3

- 5 a. Derive an expression for loss of energy head for hydraulic jump. (10 Marks)  
b. In a rectangular channel of 0.5m width, a hydraulic jump occurs at a point where depth of water flow is 0.15m and Froude number is 2.5 obtain the following :  
i) Sp. Energy ii) Critical and subsequent depths iii) Loss of head and iv) Energy dissipated. (10 Marks)

OR

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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.

- 6 a. Derive an expression for length of Back water curve. (10 Marks)  
 b. In a rectangular channel of width 24m and depth of flow 6m, the rate of flow of water is  $86.4 \text{ m}^3/\text{s}$ . If the bed slope of the channel is 1 in 4000 then find the slope of the free surface of water. Take  $C = 60$ . (10 Marks)

**Module-4**

- 7 a. Derive an expression for impulse momentum equation. (05 Marks)  
 b. Derive an expression for thrust exerted by the jet strikes a stationary curved vane at one end tangentially when the vane is symmetrical. (07 Marks)  
 c. A jet of water from a nozzle is deflected through  $60^\circ$  from its original direction by curved vane which enters tangentially without shock with a velocity of 30m/s and leaves with a mean velocity of 25m/s. If the mass issued from nozzle per second is 0.8 kg/s, calculate the magnitude and direction of the resultant force on the vane, if the vane is stationary. (08 Marks)

**OR**

- 8 a. Explain classification and efficiencies of turbines. (10 Marks)  
 b. A pelton wheel is to be designed for the following specifications :  
 Shaft power = 11,772 kW ; Head = 380m ; Speed = 750 r.p.m ; Overall efficiency = 86%  
 Jet diameter is not to exceed one – sixth of the wheel diameter. Determine  
 i) Wheel diameter ii) No. of jets required iii) Diameter of the jet.  
 Take  $K_{v1} = 0.985$  and  $K_{u1} = 0.45$ . (10 Marks)

**Module-5**

- 9 a. With the help of neat sketches, explain Francis's inward flow reaction turbine. (10 Marks)  
 b. Calculate the diameter and speed of the runner of a Kaplan turbine developing 6000 kW under an effective head of 5m. Overall efficiency of the turbine is 90%. The diameter of boss is 0.4 times the external diameter of the runner. The turbine speed ratio is 2.0 and flow ratio 0.6. What is the specific speed of the turbine? (10 Marks)

**OR**

- 10 a. Explain with neat sketches, components and working of a centrifugal pump. (10 Marks)  
 b. A centrifugal pump impeller runs at 80 r.p.m and has outlet vane angle of  $60^\circ$ . The velocity of flow is 2.5m/s throughout and diameter of impeller at exit is twice that at inlet. If the manometric head is 20m and the manometric efficiency is 75%, determine  
 i) The diameter of impeller at the exit ii) Inlet vane angle. (10 Marks)

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## Fourth Semester B.E. Degree Examination, June/July 2019 Concrete Technology

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 constituents of cement with their percentage and functions. (10 Marks)  
b. Define Fineness modulus. Explain test procedure to determine the Fineness modulus and Importance of Fineness modulus. (10 Marks)

OR

- 2 a. What are Bogue's compounds? Briefly explain their contribution towards gaining of strength of cement with graph. (10 Marks)  
b. What is an Admixture? What are the effects of air entrainment and Retarders on the properties of concrete? (10 Marks)

### Module-2

- 3 a. Define Workability. Briefly explain the factors which affects the workability of concrete. (10 Marks)  
b. What is the Importance of curing in concrete? Briefly discuss any two methods. (10 Marks)

OR

- 4 a. Mention the various stages of manufacturing of concrete. Discuss any two stages. (10 Marks)  
b. Explain good and bad practices of making and using fresh concrete. (10 Marks)

### Module-3

- 5 a. Explain the factors affects the strength of concrete. (10 Marks)  
b. Write short notes on : i) Shrinkage of concrete ii) Creep. (10 Marks)

OR

- 6 a. What is durability of concrete? Explain the factors affecting the durability of concrete. (10 Marks)  
b. Mention various non – destructive testing of concrete. Explain any two methods in brief. (10 Marks)

### Module-4

- 7 Design a concrete mix for M<sub>25</sub>.
- |  |  |
|--|--|
| a. Grade designation : M <sub>25</sub> .       | b. Type of cement : OPC 43 grade               |
| c. Max. Nominal size of aggregates 20mm down   | e. Water cement ratio : 0.50                   |
| d. Min. cement content : 300 kg/m <sup>3</sup> | g. Exposure condition : Moderate (RCC)         |
| f. Workability : 75mm slap                     | i. Max. cement content : 450 kg/m <sup>3</sup> |
| h. Method of concrete placing : Manual         | k. Fine aggregate zone : Zone 2.               |
| j. Chemical admixture : NIL                    |  |

A Cement : Type of cement = OPC 43 grade  
Specific gravity : 3.15

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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B Coarse Aggregate : Specific gravity : 2.80  
Water absorption : 1%  
Free surface moisture : NIL

C Fine Aggregate : Specific gravity : 2.65  
Water absorption : 2%  
Free surface moisture : 2%

D Chemical Admixture – NIL.

(20 Marks)

OR

- 8 Discuss the concept of mix design. Write step by step procedure for mix design using IS code. Also discuss the variables in proportioning of concrete. (20 Marks)

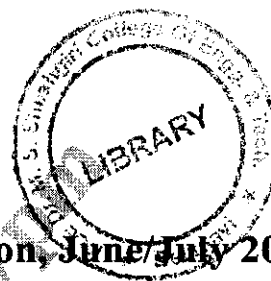
**Module-5**

- 9 a. What are requirements of RMC according QCI? Briefly discuss advantages and disadvantages of RMC. (10 Marks)  
b. What is Light weight concrete? Discuss the uses and advantages of Light weigh concrete. (10 Marks)

OR

- 10 a. Enumerate the benefits of self compacting concrete. Explain any two test on self compacting concrete. (10 Marks)  
b. List the types of Fibres used in FRC and discuss Factors affecting properties of FRC. (10 Marks)

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17CV45

## Fourth Semester B.E. Degree Examination, June/July 2019 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 a three phase diagram, explain  
 i) Void ratio    ii) Porosity    iii) Water content    iv) Degree of saturation.    (08 Marks)
- b. With usual notations, prove that  

$$e = \frac{WG}{Sr}$$
    (06 Marks)
- c. Determine the Dry density, Void ratio, Porosity and degree of saturation. Given  $\gamma_b = 26 \text{ kN/m}^3$ ,  $G = 2.67$  and  $W = 16\%$ .    (06 Marks)

OR

- 2 a. Define Liquid limit, Plastic limit and Shrinkage limit.    (06 Marks)
- b. Explain the Indian Standard Soil classification system.    (08 Marks)
- c. A fine grained soil has a liquid limit of 54% and a plastic limit of 30%. Classify the soil as per IS classification.    (06 Marks)

### Module-2

- 3 a. Explain with sketches, the common clay minerals.    (08 Marks)
- b. Following are the results of a compaction test.

Weight of soil with mould (N)	29.25	30.95	31.50	31.25	30.70
Water Content (%)	10	12	14.3	16.1	18.2

Plot the compaction curve showing MDD and OMC. Given  $G_s = 2.70$ , Volume of mould = 1000 cm<sup>3</sup>. Weight of mould = 10N.    (12 Marks)

OR

- 4 a. Explain Electrical Diffuse Double Layer.    (06 Marks)
- b. Distinguish between Standard proctor and Modified proctor compaction tests.    (04 Marks)
- c. For constructing an embankment, the soil is transported from a borrow area using a truck which can carry 6m<sup>3</sup> of soil at a time. Determine the number of truck loads of soil required to obtain 100m<sup>3</sup> of compacted earth fill and the volume of the borrow pit. Use the following details.    (10 Marks)

Property	Borrow area	Truck loose	Field compacted	Soil Type
Bulk density (kN/m <sup>3</sup> )	16.6	11.5	18.2	Well graded
Water content (%)	8	6	14%	-

### Module-3

- 5 a. What is a Flow net? What are the uses and characteristics of flow nets?    (08 Marks)
- b. The porosity of a certain sample of sand was 50% in the loose state and 34% in the dense state. The specific gravity is 2.70. Estimate the critical hydraulic gradients in loose and dense states.    (06 Marks)
- c. Compute the quantity of water seeping under a weir per day for which the flow net has been satisfactorily constructed. The coefficient of permeability is  $2 \times 10^{-2}$  mm/s.  $n_f = 5$  and  $n_d = 18$ . The difference in water level between upstream and downstream is 3.0m. The length of the weir is 60m.    (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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OR

- 6 a. With the help of neat sketches, derive an equation to determine permeability by the following Laboratory method and also state their suitability.  
 i) Constant Head Permeability Test ii) Falling Head Permeability Test. (14 Marks)  
 b. What are the factors affecting permeability? Explain them briefly. (06 Marks)

**Module-4**

- 7 a. Explain with neat sketch, the mass spring analogy. (08 Marks)  
 b. Explain normally consolidated soil and over consolidated soil. (06 Marks)  
 c. The thickness of a normally consolidated clay layer is 3.0m. The initial void ratio of the sample is 1.0 and its liquid limit is 60%. The overburden pressure at the middle of the clay layer was 154 kN/m<sup>2</sup>. Due to construction of a building the increase in effective stress is 92.4kN/m<sup>2</sup>. Determine the consolidation settlement of the clay layer. (06 Marks)

OR

- 8 a. Explain with a sketch, determination of Pre – consolidation pressure by Casagrande's method. (06 Marks)  
 b. Explain Square root of time fitting method. (06 Marks)  
 c. A 20m thick isotropic clay stratum overlies an impervious rock. The coefficient of consolidation of soil is  $5 \times 10^{-2} \text{ mm}^2/\text{s}$ . Find the time required for 50% and 90% consolidation. Time factors are 0.2 and 0.85 for 50% and 90% consolidations respectively. (08 Marks)

**Module-5**

- 9 a. Explain Mohr – Coulomb failure theory of soil. (06 Marks)  
 b. What are the factors affecting the shear strength of soil? (06 Marks)  
 c. In a shear test conducted on a river sand, the following results were obtained.

Normal Force (N)	80	160	240	320	400	480
Shear Force (N)	50	101	149	201	248	302

Determine 'e' and ' $\phi$ '.

(08 Marks)

OR

- 10 a. With the help of neat sketches, derive an equation to determine shear strength by Vane shear test. (08 Marks)  
 b. In a triaxial test on two identical soil samples, the following data was obtained.

Test No.	Cell pressure (KN/m <sup>2</sup> )	Maximum deviation stress (KN/m <sup>2</sup> )	Maximum principal stress (KN/m <sup>2</sup> )
1	50	120	-
2	100	-	332

Compute shear parameters.

(12 Marks)

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# CBCS SCHEME

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17CV46

## Fourth Semester B.E. Degree Examination, June/July 2019 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. With the help of a neat sketch of a simple circular curve? Explain.  
i) Tangent length    ii) Length of long chord    iii) Intersection angle  
iv) Point of curve    v) Point of tangency    vi) Deflection angle. (06 Marks)
- b. Define degree of a curve. Establish the relationship between degree of a curve and its radius. (04 Marks)
- c. Two tangents intersect at a chainage (59 + 60), the deflection angle being  $50^{\circ} 30'$ . Calculate the necessary data for setting out a curve of 15 chains radius to connect the two tangents, if it is intended to set out the curve by Rankine's method of deflection angles. Take the peg interval equal to 100 links, the length of the chain being 20m (100 links). Draw the curve table. (10 Marks)

OR

- 2 a. What is transition curve? List the function and essential requirements of an ideal transition curve. (06 Marks)
- b. Two straights BA and AC are intersected by a line EF. The angle BEF and EFC are  $130^{\circ}$  and  $140^{\circ}$  respectively. The radius of the first arc is 500m and that second arc 300m. Find the chainages of the tangent points and the points of compound curvature given that the chainage of the intersection point 'A' is 3200m. (07 Marks)
- c. Two parallel railway lines are to be connected by a reverse curve. Each section having the same radius. If the lines are 12 meters apart and the maximum distance between tangent points measured parallel to the straights is 48meters, find the maximum allowable radius. If however, both the radii are to be different, calculate the radius of the second branch if that of the first branch is 60meters. Also, calculate the lengths of both the branches. (07 Marks)

### Module-2

- 3 a. List the various factors that are to be considered in the selection of site for baseline and station in triangulation survey. (06 Marks)
- b. Write a note on classification of triangulation system. (06 Marks)
- c. From a satellite station 'S' which is 14m 'A', angles measured to 3 triangulations stations are as follows :  
 $\angle CSA = 32^{\circ} 45' 48''$ ,  $\angle BSC = 68^{\circ} 26' 36''$  the length of sides, AC and AB are 5678m and 1441m respectively. Find the angle of BAC. (08 Marks)

OR

- 4 a. Explain the sources and kinds of errors. (04 Marks)
- b. State and explain law of weights. (08 Marks)
- c. Find the most probable values of  $\angle A$  and  $\angle B$  from the following observation @ a station 'O'.  
 $A = 9^{\circ} 48' 36''$  cot 2  
 $B = 54^{\circ} 37' 48''$  cot 3  
 $A + B = 104^{\circ} 26' 28''$  cot 4. (08 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.

**Module-3**

- 5 a. Define the following terms :  
 i) Zenith ii) Nadis ii) Azimuth iv) The altitude v) Celestial sphere. (05 Marks)
- b. Mention the properties of a spherical triangle. (05 Marks)
- c. Find the shortest distance between two points A and B, given :  
 A latitude —  $18^{\circ} 24' N$  longitude  $36^{\circ} 18' E$   
 B latitude —  $68^{\circ} 32' N$  longitude  $126^{\circ} 34' E$ . (10 Marks)

OR

- 6 a. Define the following :  
 i) Latitude ii) Longitude iii) The visible Harizon iv) Sensible Horizon. (04 Marks)
- b. Explain Ecliptic and solstices. (06 Marks)
- c. At a point 'A' in latitude  $45^{\circ} N$ , a straight line is ranged out which runs due east at A. This straight line is prolonged for 300 nautical miles to B. find the latitude of B, and if it be desired to travel due north from B. So as to meet the  $45^{\circ}$  parallel again at 'C', find the ABC at which we must set out and the distance BC. (10 Marks)

**Module-4**

- 7 a. Define the terms :  
 i) Picture plane ii) Camera axis iii) Focal length iv) Principal plane  
 v) Perspective projection vi) Film Base. (06 Marks)
- b. With a neat sketch, derive the expression for the scale of a vertical photograph. (06 Marks)
- c. A vertical photograph was taken at an altitude of 1200m above MSL. Determine the scale of the photograph for the terrain laying at elevation of 80m and 300m. If the focal length of the camera is 15cm. (08 Marks)

OR

- 8 a. Define the terms : i) Drift ii) crab iii) mosaics. (06 Marks)
- b. Explain the procedure for aerial survey. (06 Marks)
- c. The scale of an aerial photography is  $1\text{cm} = 100\text{m}$ . The photograph size is  $20\text{cm} \times 20\text{cm}$ . determine the number of photography required to cover an area  $10\text{km} \times 10\text{km}$ , if the longitudinal lap is 60% and side lap is 30%. (08 Marks)

**Module-5**

- 9 a. Define EDM. (04 Marks)
- b. Mention the advantages of total station and also discuss the working principles of the same. (08 Marks)
- c. Define remote sensing. Explain the applications in civil engineering. (08 Marks)

OR

- 10 a. What are the advantages of LIDAR technology? (04 Marks)
- b. What is GIS? With a neat sketch, explain the components of GIS. (08 Marks)
- c. What is GPS? Explain the basic principles of GPS and its application in surveying. (08 Marks)

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# CBCS SCHEME

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15CV/CT51

## Fifth Semester B.E. Degree Examination, June/July 2019 Design of RC 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 IS456-2000 and SP-16 is permitted.  
3. Assume any missing data suitably.*

### Module-1

- 1 a. Explain the principles of limit state design. (06 Marks)  
b. Enlist the reasons for adopting partial safety factors for loads and material strength. (05 Marks)  
c. Derive from the fundamentals the expression for the area of stress block  $0.36 f_{ck} x_u$ . (05 Marks)

OR

- 2 a. Explain short term deflection and long term deflection. (06 Marks)  
b. A simply supported RCC beam of size 300mm × 600mm carries a Udl live load of 25 kN/m and superimposed load [Dead load] 12 kN/m over an effective span of 5m. It is reinforced with 4 - # 16mm diameter bars. The effective cover is 50mm. Calculate the short term deflection and long term deflection of beam, if i) Ultimate shrinkage coefficient = 0.0003, ii) Creep co-efficient = 1.6, concrete grade M20, and steel Fe415 are used. (10 Marks)

### Module-2

- 3 a. A singly reinforced concrete beam of 250mm × 450mm deep upto the centre of reinforcement is reinforced with 3-#16 at an effective cover of 50mm, effective span 6m, M20 concrete and Fe415 steel. Determine the central point load that can be supported in addition to the self weight. (10 Marks)  
b. Determine the moment of resistance of a T-beam for the following data:  
Breadth of the flange = 740mm,  
Effective depth = 400mm,  
Breadth of web = 240mm,  
Area of steel = 5 - 20 and  
Depth of flange = 110mm,  
Adopt M20 grade concrete and Fe415 steel. (06 Marks)

OR

- 4 a. A doubly reinforced beam section is 250mm wide and 450mm deep upto the centre of the tensile reinforcement. It is reinforced with 2-#16 as compression reinforcement at an effective cover of 50mm and 4-#25 as tensile steel, using M20 concrete and Fe250 steel, calculate the ultimate moment of resistance of the beam section. (09 Marks)  
b. A Tee beam has the following data:  
i) C/C spacing of beams = 3.20mt,  
ii) Simply supported efficiency span of (simply) beam ⇒ 8m  
iii) Depth of slab = 150mm  
iv) Size of web of beam = 300mm × 500mm.  
Calculate the balanced moment of resistance. (07 Marks)

1 of 2

**Module-3**

- 5 Design a reinforced concrete beam of rectangular cross-section using the following data: Effective span = 5m, width of beam = 250mm, overall depth = 500mm, service load including dead load and live load = 40kN/m, tension cover = 50mm. Adopt M20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details. (16 Marks)

**OR**

- 6 a. List the circumstance under which doubly reinforced beam are recommended. (04 Marks)  
b. A rectangular beam 230mm × 550mm deep is subjected to a sagging BM of 40 kNm, shear force of 30kN and twisting moment of 11.5 kNm at a given section. Design the reinforcement if M20 grade concrete and Fe415 steel are used. Sketch the details. (12 Marks)

**Module-4**

- 7 Design a R.C.C. slab for an office floor 4.5m × 5.5m with all four edges discontinuous and corners held down. The live load on the slab is 3kN/m<sup>2</sup>. Assume floor finish as 0.6 kN/m<sup>2</sup> and ceiling finish as 0.4 kN/m<sup>2</sup>. Use M20 concrete and Fe415 steel. Sketch the reinforcement details. (16 Marks)

**OR**

- 8 Design a Dog legged Stair for an office building in a room measuring 2.8m × 5.8m clear vertical distance between the floors is 3.6m. The width of flight is to be 1.25m. Assume live load of 3kN/m<sup>2</sup>. Use M-20 concrete and Fe-415 grade steel. Assume that the stairs are supported on 230mm at the outer edges of landing stairs. Sketch the reinforcement details. (16 Marks)

**Module-5**

- 9 a. Design the reinforcement for a square column of size 450mm × 450mm to support a service load of 1500kN. Use M20 concrete and Fe-415 steel. (08 Marks)  
b. A column size of 300mm × 400mm has an effective length of 3.6m and is subjected to  $P_u = 1100\text{kN}$  and  $M_u = 150\text{kNm}$ , about the major axis. Assuming the bars on two sides, design the column using M25 concrete and Fe415 steel. (08 Marks)

**OR**

- 10 Design an isolated footing of uniform thickness of a RC column, bearing a vertical load of 600kN and having a base of size 500mm × 500mm. The safe bearing capacity of the soil may be taken as 120kN/m<sup>2</sup>. Use M-20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details. (16 Marks)

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15CV52

## Fifth Semester B.E. Degree Examination, June/July 2019 Analysis of Indeterminate Structures

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Analyse the continuous beam shown in Fig.Q1(a) by slope deflection method. Draw bending moment diagram. EI is constant. (06 Marks)

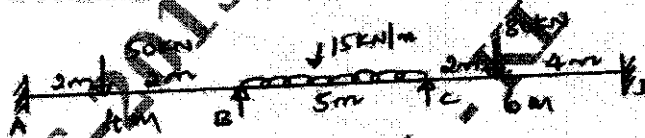


Fig.Q1(a)

- b. Analyse the portal frame shown in Fig.Q1(b) by slope deflection method. Draw bending moment diagram. (10 Marks)

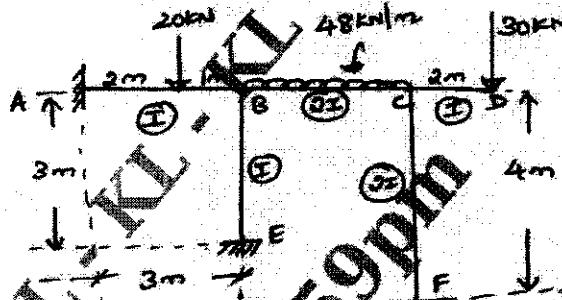


Fig.Q1(b)

- 2 a. Analyse the continuous beam shown in Fig.Q2(a) by slope deflection method. Support 'B' sinks by 3 mm. Take  $EI = 3000 \text{ kNm}^2$ . Draw bending moment diagram. (06 Marks)

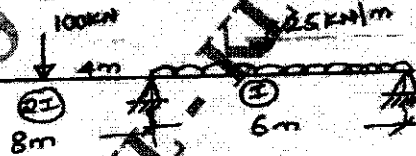


Fig.Q2(a)

- b. Analyse the portal frame shown in the Fig.Q2(b) by slope deflection method. Draw bending moment diagram. (10 Marks)

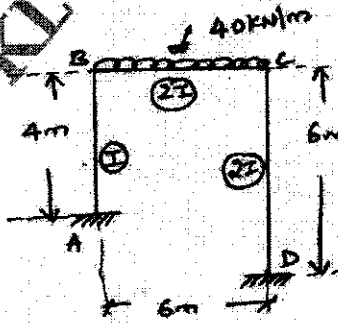


Fig.Q2(b)

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-2**

- 3 a. Analyse the continuous beam using moment distribution method. Draw bending moment and shear force diagram. Refer Fig.Q3(a). (06 Marks)

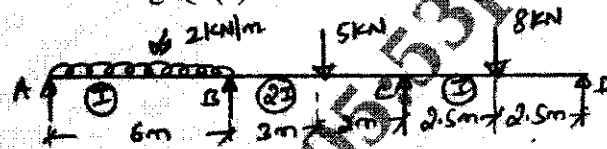


Fig.Q3(a)

- b. Analyse the portal frame shown in Fig.Q3(b) using moment distribution method. Draw bending moment diagram. Take  $EIS = 20 \text{ kN-m}^3$ . (10 Marks)

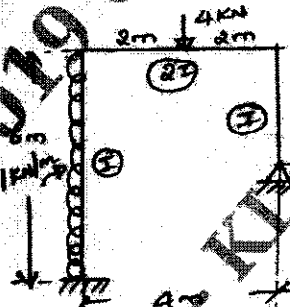


Fig.Q3(b)

OR

- 4 a. A horizontal beam is loaded as shown in Fig.Q4(a). It support 'A' sinks by 10 mm and B by 30 mm and C by 20 mm. Determine the end moments in the beam. Given  $I = 2.4 \times 10^6 \text{ mm}^4$  and  $E = 2 \times 10^5 \text{ N/mm}^2$ . (08 Marks)

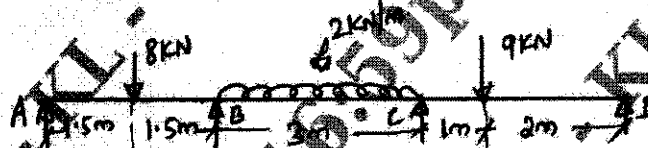


Fig.Q4(a)

- b. Analyse the portal frame shown in Fig.Q4(b) using moment distribution method. Draw bending moment. (08 Marks)

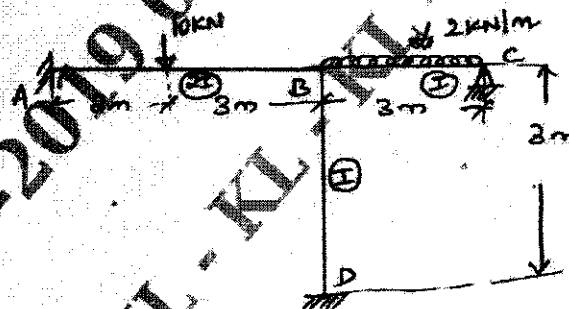


Fig.Q4(b)

**Module-3**

- 5 a. Analyse the continuous beam shown in Fig.Q5(a) using Kani's method. Draw bending moment diagram. (08 Marks)

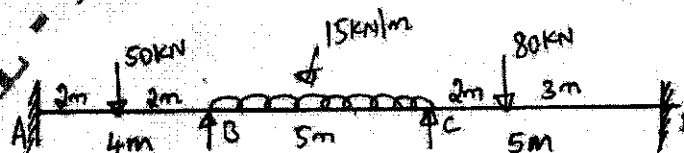


Fig.Q5(a)

- b. Analyse the frame shown in Fig.Q5(b) using Kani's method. Draw bending moment diagram. (08 Marks)

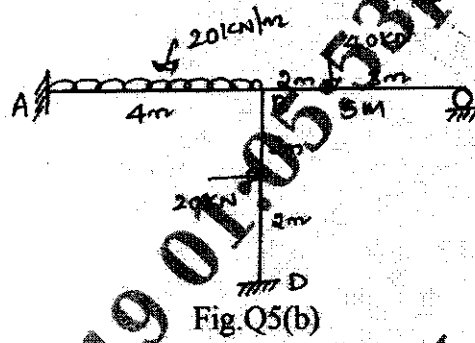


Fig.Q5(b)

OR

- 6 Analyse the frame shown in Fig.Q6 by Kani's method. Draw bending moment diagram.

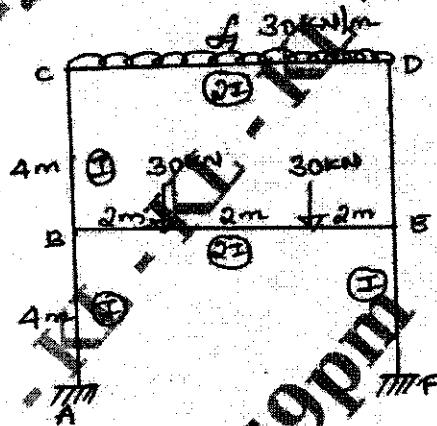


Fig.Q6

(16 Marks)

Module

- 7 a. Analyse the beam shown in Fig.Q7(a) by flexibility method and draw bending moment diagram. (08 Marks)

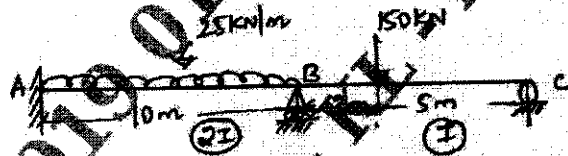


Fig.Q7(a)

- b. Analyse the frame shown in Fig.Q7(b) by flexibility method and draw bending moment diagram. (08 Marks)

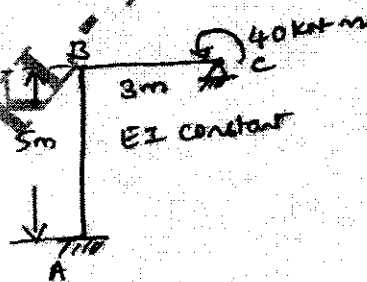


Fig.Q7(b)

OR

- 8 Analyse the pin-jointed frame shown in Fig.Q8 by flexibility method. The cross-sectional areas A and E for all members is the same. (16 Marks)

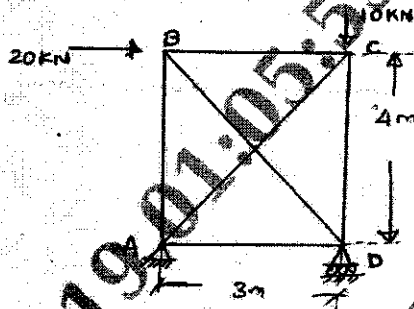


Fig.Q8

**Module-5**

- 9 a. Analyse the continuous beam shown in Fig.Q9(a) by stiffness method. Draw bending moment diagram. (08 Marks)

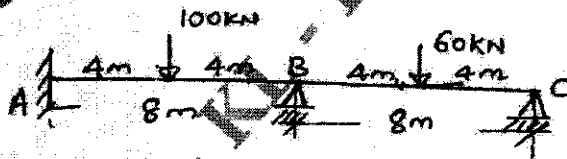


Fig.Q9(a)

- b. Analyse the portal frame shown in Fig.Q9(b) by stiffness method. Draw bending moment diagram. (08 Marks)

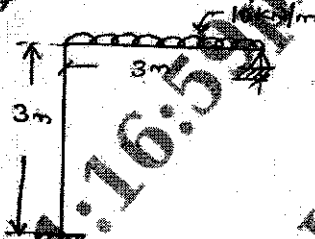


Fig.Q9(b)

OR

- 10 Using stiffness method determine the displacements at the joint 'B' of a pin-jointed frame shown in Fig.Q10. Also calculate the forces in the members AB and BC due to given loading. The values of area of cross-section are indicated. Take  $E = 2 \times 10^5 \text{ N/mm}^2$ . (16 Marks)

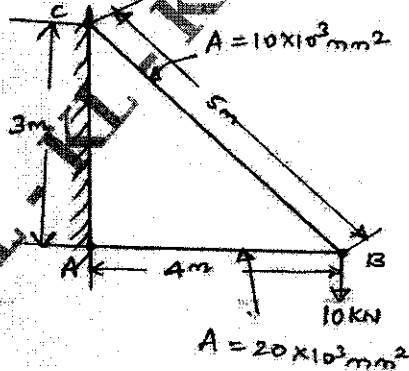


Fig.Q10

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15CV53

## Fifth Semester B.E. Degree Examination, June/July 2019 Applied Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Enumerate the objectives of subsurface exploration. (04 Marks)  
 b. Explain with reference to soil surplus : Area ratio , Inside clearance , Outside clearance and Recovery ratio. (04 Marks)  
 c. Estimate the position of ground water table from the following data :  
 Depth upto which water is boiled out is 32m. Water raise in the first day : 2.4m ,  
 Second day : 2.0m and Third day : 1.6m. (08 Marks)

OR

- 2 a. Distinguish between undisturbed , disturbed and representative soil samples. What are the tests conducted on these samples in the laboratory? (05 Marks)  
 b. Explain 'Seismic refraction method' of soil exploration, with a neat sketch on its mechanism. (06 Marks)  
 c. What is a Bore hole log? List the information recorded in it. (05 Marks)

### Module-2

- 3 a. What do you understand by 'Pressure bulb'? Illustrate with a sketch. (05 Marks)  
 b. A circular area 6m is diameter , carries a uniformly distributed load of 10kN/m<sup>2</sup>. Plot the variation of vertical stress at depths 2m , 4m and 8m. (06 Marks)  
 c. Explain the principle of 'New - marks chart'. (05 Marks)

OR

- 4 a. What are different types of settlements of footings? Explain. (04 Marks)  
 b. Estimate the immediate settlement of a footing of size 2m × 3m resting at a depth of 1.5m in sandy soil whose compression modulus is 10N/mm<sup>2</sup>. Footing is expected to transmit a unit pressure of 200kN/m<sup>2</sup>. Poisson's ratio of soil is 0.3 and influence factor for footing is 1.06. (04 Marks)  
 c. A saturated clay 8m thick underlies a proposed new building. The existing overburden pressure at the centre of clay layer is 300kN/m<sup>2</sup> and load due to new building increases the pressure by 200kN/m<sup>2</sup>. The liquid limit of soil is 75% with field water content = 50% and G<sub>s</sub> = 2.7. Estimate consolidation settlement. (08 Marks)

### Module-3

- 5 a. Explain step by step procedure of Culmann's graphical construction for determination of Active pressure. (04 Marks)  
 b. A 4.5m high retaining wall retains a cohesive soil with C = 10kN/m<sup>2</sup> ,  $\phi = 20^\circ$  and  $\gamma = 16\text{kN/m}^3$ . Calculate the depth of tension cracks and critical depth. (04 Marks)  
 c. A retaining wall 6.6m high retains a cohesionless soil whose properties are  $\phi = 25^\circ$  , G = 2.6 and e = 0.6. The water table is at n depth of 2.1m below GL. Draw the earth pressure diagram and calculate magnitude and position of active earth pressure above the base of the wall. (08 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.

OR

- 6 a. What are the causes of slope failure? List and enumerate the types of failures in finite slopes. (03 Marks)
- b. List and enumerate the types of failures in finite slopes. (03 Marks)
- c. An embankment 6m high has a slope of 1V : 2H. The soil properties are  $C = 5\text{kN/m}^2$ ,  $\phi = 30^\circ$  and  $\gamma = 19\text{kN/m}^3$ . A trial slip circle of radius 8.8m and passing thro' the toe has its centre at the same level as the top of embankment. Find the factor of safety by the 'method of slices'. (10 Marks)

**Module-4**

- 7 a. Define Ultimate bearing capacity, Safe bearing capacity and Allowable bearing pressure. (03 Marks)
- b. List the assumption made in Terzaghi's b.c theory. (03 Marks)
- c. Determine the safe bearing capacity of a square footing of side 1.8m, located at a depth of 1.5m below GL in a soil having  $\gamma = 16.2\text{kN/m}^3$ ,  $C = 15\text{kN/m}^2$  and  $\phi = 35^\circ$ . Take  $N_c = 57.8$ ,  $N_q = 41.1$  and  $N_r = 42.4$  with FS = 3. Assume water table at great depth, what will be the SBC if WT rises to the base of footing. (10 Marks)

OR

- 8 a. Explain the three modes of shear failure below the footing, with neat sketches. (04 Marks)
- b. Discuss the effect of size and shape on the bearing capacity of footing on :  
i) Sand ii) Clay. (04 Marks)
- c. Proportion a square footing to carry a load of 900kN from a column  $400 \times 400\text{mm}$  in section and located at a depth of 1.5m below GL. The soil has  $C = 0$ ,  $\phi = 36^\circ$ ,  $\gamma = 17.5\text{kN/m}^3$  above water table and  $\gamma_{\text{sat}} = 20\text{kN/cm}^3$  below water table (WT). The WT is at the base of the footing. Permissible settlement is 25mm, Corrected N - Value = 30. Use a FS = 2. [Use of IS : 6403 is permitted]. No structural design required. (08 Marks)

**Module-5**

- 9 a. Classify the pile foundations according to material and function, with neat figures. (04 Marks)
- b. Explain in detail, the principle associated with determination of pile load capacity using static formula. (04 Marks)
- c. A 12m long, 30mm dia. pile is driven in uniform deposit of sand with  $\phi = 40^\circ$ . The W.T is at great depth. The average dry unit weight of sand is  $18\text{kN/m}^3$ . Using  $N_q = 137$ , calculate the safe load capacity of single pile with a FS = 2.5 and angle of wall friction ( $\delta$ ) =  $30^\circ$ . (08 Marks)

OR

- 10 a. What is meant by efficiency of pile groups? Discuss Feld's rule for its determination. (04 Marks)
- b. What is Negative friction? Under what situation negative skin friction occurs. (04 Marks)
- c. Calculate the safe load carrying capacity of a 16 pile group arranged in a square pattern with each pile is of 400mm diameter, 9m length and with a spacing of 1.2m c/c. The soil is 14m deep clay with unconfined strength of  $100\text{kN/m}^2$ ,  $r = 16\text{kN/m}^3$  and  $r^1 = 9\text{kN/m}^3$  with adhesion factor ( $\alpha$ ) = 0.7. W.T is 1m below GL. Use a FS = 2.5. (08 Marks)

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## Fifth Semester B.E. Degree Examination, June/July 2019 Railways, Harbours, Tunneling and Airports

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Draw typical cross-section of permanent way. Discuss in brief the basic functions of various components of railway track. (08 Marks)
- b. Calculate maximum permissible speed on curve of high speed B.G. track having following particulars:
  - (i) Degree of curve =  $1^\circ$
  - (ii) Amount of superelevation = 8.0 cm
  - (iii) Length of transition curve = 130 m
  - (iv) Max. speed of section likely to be sanctioned is 150 kmph. (08 Marks)

OR

- 2 a. Explain : (i) Coning of wheel (ii) Creep in rails (08 Marks)
- b. Calculate all necessary elements required to set out a 1 in  $8\frac{1}{2}$  turnout, taking off from straight B.G. track with its curve starting from toe of the switch i.e., tangential to the gauge face of outer main rail and passes through theoretical nose of crossing i.e, TNC. Given heel divergence  $d = 11.4$  cm. (08 Marks)

### Module-2

- 3 a. List the modern surveying techniques that can be utilized for preliminary survey of railway line for difficult terrain. Explain any two techniques. (06 Marks)
- b. Explain tier system of track maintenance. (10 Marks)

OR

- 4 a. What are the advantages and limitations of underground railways? (08 Marks)
- b. For a rail of 11.89m length, calculate the quantity of materials required per km. Length of track. Assume sleeper density to be equal to  $(1.0936n + 4)$ . (08 Marks)

### Module-3

- 5 a. Explain various shapes of tunnels with neat sketches. (04 Marks)
- b. Explain with neat sketches the natural classification of harbours. (06 Marks)
- c. Mention objects of tunnel lining. List materials used for lining. (06 Marks)

OR

- 6 a. List methods of tunneling in hard rock. Explain any one method. (06 Marks)
- b. Explain the natural phenomena considered in the design of harbour. (06 Marks)
- c. What is importance of tunnel ventilation? Explain methods adopted for ventilation. (04 Marks)

### Module-4

- 7 a. Write a brief note on "Airport classifications". (08 Marks)
- b. Explain factors which influence the airport site selection. (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. What is "Regional planning"? What information will regional plan provide? List various data to be collected for scientific and sound regional plan. (08 Marks)
- b. Write short note on :  
 (i) Holding apron  
 (ii) Imaginary surfaces. (08 Marks)

Module-5

- 9 a. What is wind rose diagram? Explain briefly with a neat sketch any one method of orientation of runway. (06 Marks)
- b. Calculate actual length of runway from following data:  
 (i) Airport elevation = R.L. 105m  
 (ii) Airport reference temperature = 30°C  
 (iii) Runway basic length = 1200 m  
 (iv) Highest point along length = R.L. 107m  
 (v) Lowest point along length = R.L. 101m. (10 Marks)

OR

- 10 a. Explain the following :  
 (i) Airport marking (ii) Airport lighting (08 Marks)
- b. Explain principles adopted in design of an exit taxiway connecting runway and a parallel taxiway. On a neat typical layout, indicate various design elements. (08 Marks)

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15CV553

## Fifth Semester B.E. Degree Examination, June/July 2019 Masonry Structures

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS 1905 – 1987 is permitted.

### Module-1

- 1 a. Classify bricks and list the qualities of good bricks. (08 Marks)  
b. Derive an expression for brick prism under compression by elastic theory. (08 Marks)

OR

- 2 a. What are the desirable properties of mortar for use in masonry construction? Explain. (08 Marks)  
b. Explain briefly factors affecting compression strength of masonry. (08 Marks)

### Module-2

- 3 a. Define wall. List different types of walls with neat sketches. (08 Marks)  
b. Explain the effect of eccentricity, load dispersion and arching action in masonry. (08 Marks)

OR

- 4 a. Explain briefly stress reduction factor, shape modification factor and increase in permissible stress for eccentric loads. (08 Marks)  
b. An interior solid wall of a two storey building is 200mm thick with a ceiling height of 4m, it is constructed with bricks of  $10\text{N/mm}^2$  and  $M_1$  type mortar, the wall is fully restrained at top and bottom. Solve for permissible compressive stress. (08 Marks)

### Module-3

- 5 a. Explain the design criteria of masonry wall subjected to axial load. (06 Marks)  
b. Design an interior cross wall of a two storeyed building with 100mm thick RCC slab and 3m ceiling height. The wall is unstiffened and it supports 2.65m slab on either side take live load on roof as  $1.5\text{kN/m}^2$ , live load on floor as  $2\text{kN/m}^2$ . Assume floor finish as  $0.2\text{kN/m}^2$ , thickness of lime terrace as 80mm and thickness of wall as 100mm. (10 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. Design an interior solid wall for a two storeyed building. The wall is 3.6m long and stiffened at the ends by 100mm thick intersecting walls. The ceiling height of each floor is 3m. Assume thickness of wall as 200mm. Take total load on wall as 100kN including self weight. (06 Marks)
- b. Design a interior cavity wall for a three storey building. The ceiling height of each storey being 3m. The wall is stiffened by intersecting walls at 3600mm center to center. The thickness of intersecting wall is 200mm. Assume roof load as 16kN/m and floor load as 12.5 kN/m. Refer the Fig.Q6(b). (10 Marks)

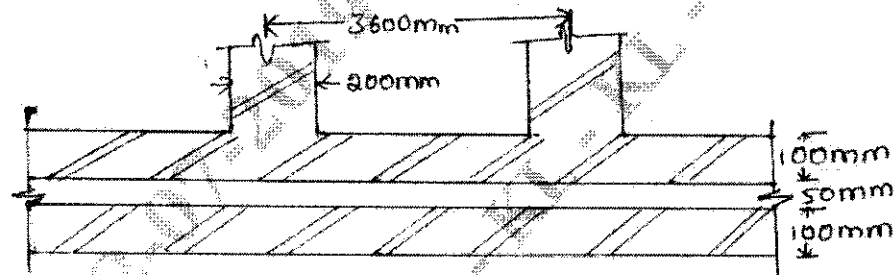


Fig.Q6(b)

**Module-4**

- 7 a. Explain the design criteria for eccentrically loaded walls. (06 Marks)
- b. Design an exterior wall for a workshop building which is 3.6m height and carries a steel truss at the top at 4.5m spacing. The wall is tied at roof and floor level. Take concentrated reaction from roof truss as 30 kN, roof load as 7kN/m and thickness of wall as 200mm. Assume width a thickness of pier as 200 mm and 400mm respectively. (10 Marks)

OR

- 8 a. What is equivalent eccentricity? Explain stress distribution under eccentric loads with neat sketch. (06 Marks)
- b. Design an external wall of a single storeyed building whose inner leaf supports an eccentric load 7kN at an eccentricity of 25mm. The wall is unstiffened and is supported by a concrete roof at the top and rests on foundation block at bottom. Take the height of wall as 4m and overall thickness of cavity wall as 250mm with 50mm cavity in between. (10 Marks)

**Module-5**

- 9 a. Discuss the design principles of walls subjected to transverse load. (06 Marks)
- b. Design an exterior wall of warehouse 3.5m height the loading on wall consists of vertical load 25kN/m from the roof and wind a pressure of 360 N/m<sup>2</sup>. The wall is hinged with the metal anchor at floor and roof level take thickness of wall as 200mm. (10 Marks)

OR

- 10 a. What are infilled frames? Explain different modes of failures in infilled frames. (08 Marks)
- b. Write a short note on :  
 i) Reinforced brick masonry  
 ii) Lintels. (08 Marks)

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## Fifth Semester B.E. Degree Examination, June/July 2019 Traffic Engineering

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 interdependency of "land use and transport" with a diagram. (10 Marks)
- b. Discuss briefly the PIEV theory. (06 Marks)

OR

- 2 a. Describe the fundamentals of traffic flow. (06 Marks)
- b. A passenger car weighing 3 tonnes is required to accelerate at a rate of  $3\text{m/sec}^2$  in the first gear from 9 speed of 10 kmph to 25kmph. The gradient is +1% and road has a black topped surface. The frontal projection area of the car is  $2\text{m}^2$ . The car tyres have radius of 0.33m. The rear axle gear ratio is 3.82 : 1 and the first gear ratio is 2.78 : 1. Calculate the speed of the engine. The radius and deformation factor for tyres is 0.36 and 0.95 respectively. Assume transmission efficiency as 0.88 and  $f = 0.02$ ,  $c_a = 0.39$ . (10 Marks)

### Module-2

- 3 a. Explain the different types of classified volume survey presentation. (06 Marks)
- b. Two vehicles A and B approaching at right angles, A from west and b from south, collide with each other. After collision, vehicle 'A' skids in a direction  $50^\circ$  N of west and vehicle 'B'  $60^\circ$  E of north. The initial skid distances of vehicles 'A' and 'B' are 38m and 20m respectively before collision. The skid distance after collision are 15m and 36m respectively. If the weights of vehicles 'A' and 'B' are 4.0 and 6.0T. Calculate the original speeds of vehicle. Assume  $f = 0.55$ . (10 Marks)

OR

- 4 a. Explain concept of Level Of Service (LOS) and its applications. (06 Marks)
- b. The table Q4(b) below gives the consolidated data of spot speed studies on a section of a road. Determine : i) the upper and lower values or speed limits for installing speed regulations ii) modal speed for the range.

Table Q4(b) : Speed Studies

Speed range kmph	Number of speed observations	Speed range kmph	Number of speed observations
0 - 10	0	50 - 60	216
10 - 20	11	60 - 70	68
20 - 30	30	70 - 80	24
30 - 40	105	80 - 90	0
40 - 50	233		

(10 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. At a right angled intersection of two roads, road 1 has four lanes and road 2 has two lanes with a width of 12m and 6.6m respectively. The volume of traffic approaching the intersection during design hour are 900 and 743 PCU/hr on the two approaches of road 2. design the signal timings as per IRC. (12 Marks)
- b. Explain the significant roles of traffic control personnel. (04 Marks)

**OR**

- 6 a. Explain the three types of traffic signals with 3 examples for each with diagrams. (10 Marks)
- b. Explain the design factors to be considered for design of rotary intersection. (06 Marks)

**Module-4**

- 7 a. Describe the causes of road accidents and also suggest preventive measures to control accidents. (08 Marks)
- b. Describe the various environmental hazards due to traffic in urban areas. (08 Marks)

**OR**

- 8 a. Explain the arrangement of street lighting in urban areas and show the lighting arrangement sketch for signalized and rotary intersections. (08 Marks)
- b. Explain the importance and promotion of non motorized transport. (08 Marks)

**Module-5**

- 9 a. Explain the various methods of traffic segregation. (08 Marks)
- b. Explain the concept of area traffic management system control (ATC) with an example. (08 Marks)

**OR**

- 10 a. Explain applications of Intelligent Transport System (ITS). (08 Marks)
- b. Explain parking pricing and congestion pricing methods to control traffic management. (08 Marks)

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15CV564

## Fifth Semester B.E. Degree Examination, June/July 2019 Occupational Health and Safety

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Outline the circumstances that led to development of OSHA and state the mission and purpose of OSHA. (09 Marks)  
b. Discuss in detail the two important responsibility of employer according to OSHA. (07 Marks)

OR

- 2 a. Enumerate the axioms of Industrial Safety. (08 Marks)  
b. Briefly explain the Dominos theory of accident causation. (08 Marks)

### Module-2

- 3 a. Describe the OSHA's Ergonomic Guidelines. (10 Marks)  
b. Brief out the NSC's Recommendations for conducting a Task Analysis. (06 Marks)

OR

- 4 a. Define "Hazard". Explain the FTA with an example. (10 Marks)  
b. Discuss the various hazard deterrence methods. (06 Marks)

### Module-3

- 5 a. Classify the types of fire and enumerate the early fire detection devices used. (06 Marks)  
b. Name different types of fire extinguishers used and explain any two with sketches. (10 Marks)

OR

- 6 a. Describe the importance of Electrical Safety. (04 Marks)  
b. Summarize the technical requirements of Product Safety Programme. (12 Marks)

### Module-4

- 7 a. Write the classification of Repeated Strain Injury and types of disorder associated with it. (06 Marks)  
b. Suggest the measures adopted to control the risk of occupational health. (10 Marks)

OR

- 8 a. Explain the importance of PPE's at workplace. (06 Marks)  
b. briefly discuss about the EMP for safety. (10 Marks)

### Module-5

- 9 a. Explain the health and safety aspects to be considered in waste water treatment plants. (10 Marks)  
b. Summarize the potential hazards posed for workers at construction sites. (06 Marks)

OR

- 10 a. Discuss the occupational health hazard posed in an epoxy manufacturing unit. (06 Marks)  
b. Comment on the Roles and Responsibilities of workers and managers in Safety programs. (10 Marks)

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15CV61

## Sixth Semester B.E. Degree Examination, June/July 2019 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 and explain any two characteristics of Management? (08 Marks)  
b. Explain the advantages and disadvantages of Planning. (08 Marks)

OR

- 2 a. Explain the purpose of planning process. (08 Marks)  
b. Explain the Critical Path Method (CPM). (08 Marks)

### Module-2

- 3 a. What are the factors affecting the productivity? (08 Marks)  
b. Explain the function of Materials Management. (08 Marks)

OR

- 4 a. What are the advantages of utilizing the construction equipments? (08 Marks)  
b. List out the various classification of the construction equipment and explain any one type of construction equipment. (08 Marks)

### Module-3

- 5 a. Define Inspection and explain the types of inspection. (08 Marks)  
b. Explain Integrity and trust worthiness. (08 Marks)

OR

- 6 a. Define Quality and what are the dimensions of quality. (08 Marks)  
b. Differentiate between Moral the Ethics. (08 Marks)

### Module-4

- 7 a. Explain the principles of Engineering Economy. (08 Marks)  
b. Differentiate between Micro and Macro Economics. (08 Marks)

OR

- 8 a. Determine the effective interest rate for a nominal annual rate of 8% that is compounded.  
i) Daily ii) Monthly iii) Quarterly iv) Semi Annually. (08 Marks)  
b. A person estimates an expenditure of Rs 10 lakh for her daughters medical college from now. He plans to deposit an equal amount at the end of every year for next 10 years at a rate of interest 8% compounded annually. Find the equivalent amount that must be deposited at the end of every year for next 8 years. (08 Marks)

### Module-5

- 9 a. What are the function of Entrepreneurship? (08 Marks)  
b. List out the various objectives and functional activities of Karnataka State Finance Corporation. (08 Marks)

OR

- 10 a. What are the Barriers to Entrepreneurship? (08 Marks)  
b. Explain the characteristics or importance of market plan. (08 Marks)

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## Sixth Semester B.E. Degree Examination, June/July 2019 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 IS : 800 - 2007 and steel tables are permitted.**

### Module-1

- 1 a. What are the advantages and disadvantages of using steel structure? (05 marks)
- b. Explain briefly limit state method of design of structure. Mention the limit states. (05 marks)
- c. What are rolled used steel sections? Mention different types of RS sections used in constructions. (06 Marks)

OR

- 2 a. Explain the terms : i) plastic hinge ii) collapse mechanism. (03 marks)
- b. Find the shape factor and plastic moment capacity for a built up beam section shown in fig.Q2(b). (05 Marks)

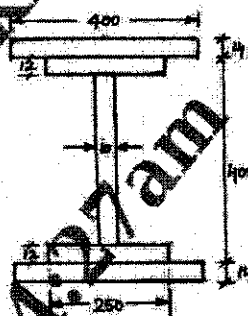


Fig.Q2(b)

- c. Determine the plastic moment capacity ( $M_p$ ) for the beam loaded as shown in Fig. Q2(c). Use load factor = 1.50.

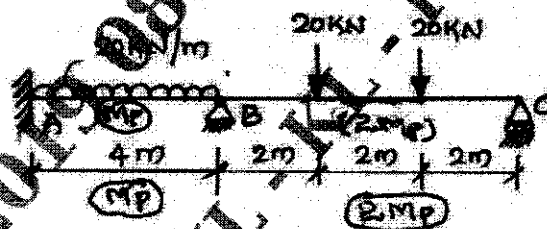


Fig.Q2(c)

(08 Marks)

### Module-2

- 3 a. Explain various modes of failure of bolted connections. (06 Marks)
- b. Mention any four advantages and disadvantages of HSFG Bolts. (04 Marks)
- c. An ISA 100 mm × 100 mm × 10 mm carries a load of 100 kN. It is to be joined with a 12 mm thick gusset plate. Design the joint using HSFG bolts of 16 mm diameter and grade 8.8, when i) no slip is permitted ii) slip is permitted. Steel is of grade Fe410. (06 Marks)

OR

- 4 a. What are common defects in welding? Explain briefly with neat sketches. (06 Marks)
- b. A tie member of roof truss consists of 2 ISA 100 × 75 × 8 mm and are connected to both the sides of 10 mm gusset plate, by longer legs. Factored axial force in the member is 500 kN. Design the welded joint by providing weld i) along two parallel sides of angle ii) along all 3 sides of connected angle. Assume shop weld. (10 Marks)

**Module-3**

- 5 a. Explain the possible modes of failure of axially loaded columns. (03 Marks)
- b. A double angle discontinuous strut ISA 150 × 75 × 10mm, long leg back to back is connected to either side of 10mm gusset plate by 2 bolts in a row. The length of strut between point of intersection is 3.5m and are tack bolted all along the length. Determine the safe load that the strut can carry. (05 Marks)
- c. A built up column consists of ISMB 250@ 366N/m with two side plates 250mm × 10mm as shown in Fig.Q5(c). Compute the maximum compressive load that the column can carry, if the length of the column is 6.25m ends of columns are restrained in position at both the ends, and one end is restrained against rotation. (08 Marks)

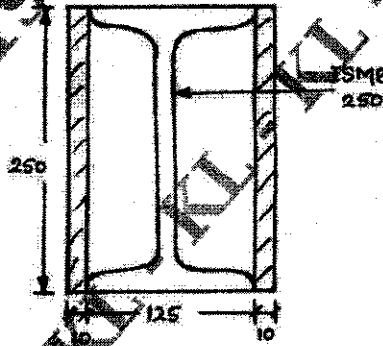


Fig.Q5(c)

OR

- 6 Design a built up column comprising of two channel section placed back to back to carry a load of 1000 kN over a length of 10m. The ends of compression member are restrained in position but not in direction/rotation. Design single lacing system also with 20mm diameter bolts for connections. (16 Marks)

**Module-4**

- 7 a. What are lug angles? Briefly explain advantages and disadvantages of using lug angles in bolted connections. (06 Marks)
- b. Design an unequal single angle section to carry a load of 140 kN in tension. Use M20, 4.6 grade bolts. The length of the member is 3m. (10 Marks)

OR

- 8 a. Distinguish between slab base and gusseted base. (03 Marks)
- b. Design a gusseted base for a built up column ISHB 350@ 674 N/m with 400mm × 20mm flange plates carrying an axial load of 2000 kN. Assume M<sub>20</sub> grade concrete and M<sub>24</sub> bolts of grade 4.6. SBC = 200 kN/M<sup>2</sup>. (13 Marks)

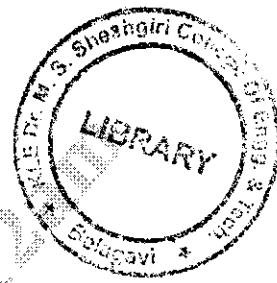
**Module-5**

- 9 a. Briefly explain the factors affecting lateral stability of beams. (04 Marks)
- b. Design one of the internal beams of span 6m (clear), spaced in the hall at 3.5m c/c, supports 130mm thick RCC slab. Take imposed load of 5kN/m<sup>2</sup> and finishes 1.5 kN/m<sup>2</sup>. Bearing of wall 300mm. The beam is laterally restrained. Check for shear, moment capacity and deflection. (12 Marks)

OR

- 10 a. Write a note on laterally unsupported beam. (04 Marks)
- b. Briefly explain different types of seated connections. (05 Marks)
- c. Explain the necessities of providing column splices. With neat sketches write about any two types of column splices. (07 Marks)

# CBCS SCHEME



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15CV63

## Sixth Semester B.E. Degree Examination, June/July 2019 Highway Engineering

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Mention different modes of transportation. Explain the characteristics of road transport in comparison with other systems. (08 Marks)
- b. Determine the length of different categories of roads in a state in India by the year 2021 as per 3<sup>rd</sup> year road plan formulae. The area of state is 3,08,000 km<sup>2</sup>. Number of Towns as per 1981 census was 276. Overall road density aimed at 82km per 100km<sup>2</sup>. (08 Marks)

OR

- 2 a. What are the types of roads and its classification? Briefly outline classification of urban roads. (08 Marks)
- b. Three new roads A, B and C are to be completed in a district during a five year plan period. Work out the order of priority for phasing the plan programme by maximum utility principle, from the data given below. Adopt utility unit of 1.0 for serving a village with population range 2000-5000, for catering for 1000T of agricultural products or per 100T of industrial products. Assume any other required data suitably.

Road	Length km	Number of village served population			Productivity 1000T	
		<2000	2000 – 5000	>5000	Agricultural	Industrial
A	15	10	8	3	15	1.2
B	12	16	3	1	11	0.0
C	18	20	10	2	20	0.8

(08 Marks)

### Module-2

- 3 a. Clarify the features of ideal alignment and enumerate factors affecting alignment. (08 Marks)
- b. Write a brief outline on engineering surveys. (08 Marks)

OR

- 4 a. With neat sketches illustrate different cross section elements. (08 Marks)
- b. The speed of overtaking and overtaken vehicles are 70 and 40 kmph respectively on a two way traffic road. If the acceleration of overtaking vehicle is 0.99 m/sec<sup>2</sup>.
- Calculate safe overtaking sight distance.
  - Mention the minimum length of overtaking zone
  - Draw a neat sketch of the overtaking zone and show the positions of the sign posts.

(08 Marks)

### Module-3

- 5 a. With neat sketches illustrate conduction of plate load test to determine modulus of subgrade reaction. (08 Marks)
- b. Distinguish between :
- Tar and Bitumen
  - Cutback and Emulsion.

(08 Marks)

1 of 2

OR

- 6 a. Enumerate different types of pavements with their component parts and functions of each component. (08 Marks)
- b. Calculate ESWL of a dual wheel assembly carrying 2004 kg each for pavement thickness of 15, 20 and 25 cms. Centre to centre tyre spacing = 27cm and distance between the walls of the tyres = 11cm. Use graphical method. (08 Marks)

**Module-4**

- 7 a. Briefly outline the design procedure of soil aggregate mixes by Rothfuch's method. (08 Marks)
- b. Explain the procedure of marshall mix design of Bituminous mixes. (08 Marks)

OR

- 8 a. Enumerate in detail the requirements, specifications of materials and the construction steps for a wet mix macadam (WMM) layer. (08 Marks)
- b. Explain in detail the requirements, specifications of materials and the construction steps for pavement quality concrete. (08 Marks)

**Module-5**

- 9 a. Explain with sketches how the subsurface drainage system is provided to lower the water table. (08 Marks)
- b. The maximum quantity of water expected in one of the open longitudinal drains on clayey soil is  $0.9 \text{ m}^3/\text{sec}$ . Design the cross section and longitudinal slope of trapezoidal drain assuming the bottom width of the trapezoidal section to be 1.0m and cross slope to be 1.0 vertical to 1.5 horizontal. The allowable velocity of flow in the drain is 1.2 m/sec and  $n = 0.02$ . (08 Marks)

OR

- 10 a. Briefly describe the different methods of economic analysis of a highway. (08 Marks)
- b. Calculate the annual cost of a stretch of a highway from the following particulars:

Item	Total cost (Rs. in lakh)	Estimated life (years)	Rate of interest (%)
Land	12	100	6
Earthwork	9.0	40	8
Bridges and culverts	7.5	60	8
Pavement	14	15	10

(08 Marks)

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## Sixth Semester B.E. Degree Examination, June/July 2019 Water Supply and Treatment Engineering

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Explain the importance and need for protected water supply. (06 Marks)  
b. Enumerate the fire demand in water supply. (03 Marks)  
c. The population of a city in three consecutive years i.e. 1991, 2001 and 2011 is 80,000, 2,50,000 and 4,80,000 respectively. Determine: (i) The saturation population (ii) The equation of logistic curve (iii) The expected population in 2021. (07 Marks)

OR

- 2 a. What is meant by per capita demand? (02 Marks)  
b. Explain geometrical and incremental increase method of population forecasting. (07 Marks)  
c. The following population data are available for a town. Estimate the probable population in the year 2031 by geometrical and incremental increase methods:

Year	1971	1981	1991	2001
Population	80,000	1,20,000	1,68,000	2,28,000

(07 Marks)

### Module-2

- 3 a. Explain the objectives of water treatment. (06 Marks)  
b. List the physical water quality characteristics. (03 Marks)  
c. Discuss the complete sequence of water treatment plant with a flow diagram. (07 Marks)

OR

- 4 a. What are the objectives of water quality management? (05 Marks)  
b. Discuss the effect of excess concentration of hardness, nitrogen and fluoride in drinking water. (06 Marks)  
c. Explain the importance of bacteriological tests in determining the quality of drinking water. (05 Marks)

### Module-3

- 5 a. Define surface flow rate and detention period for a sedimentation tank. (04 Marks)  
b. Describe briefly the various constituents of coagulation sedimentation tank. (06 Marks)  
c. A rectangular settling tank without mechanical equipment is to treat 1.8 MLD of raw water. The sedimentation period is to be 4h, the velocity of flow is 8 cm/min, and the depth of the water and sediment is 4.2 m. If an allowance of 1.2 m for sediment is made, what should be (i) the length of the basin (ii) the width of the basin? (06 Marks)

OR

- 6 a. Explain with a neat sketch the working and back washing of rapid gravity sand filter. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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- b. Find the area and number of units required for rapid sand filtration to serve a population of 2,00,000. Take average rate of demand = 160 lpcd and maximum demand as 1.8 times.  
 Rate of filtration =  $5 \text{ m}^3/\text{h}/\text{m}^2$   
 Size of each filter =  $10 \text{ m} \times 5 \text{ m}$  (06 Marks)

**Module-4**

- 7 a. List the requirement of good disinfectant. (03 Marks)  
 b. Explain the theory of chlorination of water with chemical equations (08 Marks)  
 c. Enumerate the treatment of swimming pool water. (05 Marks)

**OR**

- 8 a. What is softening of water? Discuss the lime soda process of water softening with chemical equations. (10 Marks)  
 b. Explain the reverse osmosis process of softening of water. (06 Marks)

**Module-5**

- 9 a. Discuss the factors governing the selection of source of water for water supply scheme. (04 Marks)  
 b. Explain with a neat sketch a wet intake tower structure. (06 Marks)  
 c. For water supply of a town, water is pumped from a river 3 km away into a reservoir. The maximum difference of levels of water in river and the reservoir is 20 m. The population of the town is 50000 and per capita demand is 120 c/d. If pumps are to operate for a total of 8 hr and the efficiency of pumps is 80%, determine the horse power of the pumps. Assume average daily demand as 1.5 times the average,  $f' = 0.03$  and  $v = 2\text{m}/\text{sec}$ . (06 Marks)

**OR**

- 10 a. Discuss the various methods of distribution of water and give the advantages and disadvantages of any two systems. (08 Marks)  
 b. What is service reservoir? Explain with a neat diagram. (08 Marks)

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15CV651

## Sixth Semester B.E. Degree Examination, June/July 2019 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. Explain the different sources and types of solid wastes. (06 Marks)  
b. Estimate the density of a solid waste sample, on as discarded basis. Take 1000kg sample. (10 Marks)

Component	% by mass	Density (kg/m <sup>3</sup> )
Food waste	20	300
Paper	40	100
Plastics	5	90
Garden trimmings	15	150
Wood	5	250
Tin cans	5	100
Cardboard	10	80

OR

- 2 a. With a neat sketch, explain hauled container system and stationary container system. (10 Marks)  
b. With a neat sketch, explain the different types of Transfer stations. (06 Marks)

### Module-2

- 3 a. Explain the process of incineration with the aid of neat sketch. (08 Marks)  
b. Explain the following :  
i) Mechanical volume reduction      ii) Component separation. (08 Marks)

OR

- 4 a. Describe the effect of 3T's in incineration process of solid waste. (08 Marks)  
b. Write a note on Air pollution and its control. (08 Marks)

### Module-3

- 5 a. What are the important factors for the design consideration in Anaerobic composting? (06 Marks)  
b. Write a note on Vermi composting. (04 Marks)  
c. Determine the amounts of oxygen required to oxidize 1 tonne of waste and also to stabilize Ammonia in having the chemical equation C<sub>50</sub> H<sub>100</sub> O<sub>40</sub> N. (06 Marks)

OR

- 6 a. Determine the landfill area required for municipality with a population of 50,000 given that Solid waste generation = 350gm/person/day ; Compacted density of landfill = 504 kg/m<sup>3</sup> ; Average depth of compacted solid waste = 3m. (04 Marks)  
b. What is Leachate? What are its effects on ground water? (04 Marks)  
c. List and explain briefly the various factors that must be considered in evaluating a potential landfill site. (08 Marks)

1 of 2

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**Module-4**

- 7 a. Explain the Bio – medical waste disposal methods. (08 Marks)  
b. List the various sources of e – waste, hazardous and construction waste. (08 Marks)

OR

- 8 a. Explain the categories of hazardous waste and its method of disposal. (08 Marks)  
b. Discuss about collection , treatment and disposal of construction waste. (08 Marks)

**Module-5**

- 9 a. Describe about the various types of incinerations. (08 Marks)  
b. Write short notes on :  
i) Energy recovery operation ii) Significance of Reuse in solid waste. (08 Marks)

OR

- 10 a. Define Pyrolysis. Briefly explain the process of pyrolysis. (08 Marks)  
b. Explain the design criteria for incineration. (08 Marks)

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15CV652

## Sixth Semester B.E. Degree Examination, June/July 2019 Matrix Methods of Structural Analysis

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Define : (i) Degree of Redundancy, (ii) Degree of Freedom  
(iii) Flexibility (iv) Stiffness (08 Marks)
- b. Assemble the stiffness matrix of the beam element shown in the figure with respect to the given co-ordinates. Refer Fig.Q1(b). (08 Marks)



Fig.Q1(b)

OR

- 2 a. Determine the degrees of static and kinematic indeterminacy of the structures shown in the Fig.Q2(a). (06 Marks)

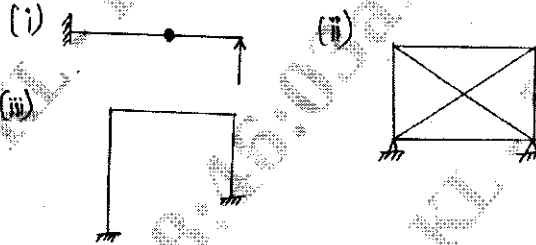


Fig.Q2(a)

- b. Develop the flexibility and stiffness matrices for the beam element shown in Fig.Q2(b) with respect to the given co-ordinates and show that flexibility and stiffness are inverse to each other. (10 Marks)

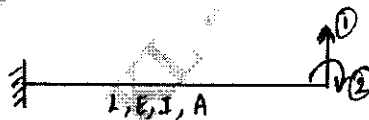


Fig.Q2(b)

### Module-2

- 3 Analyse the continuous beam shown in the Fig.Q3 by element flexibility matrix method. Draw BMD and elastic curve. (16 Marks)

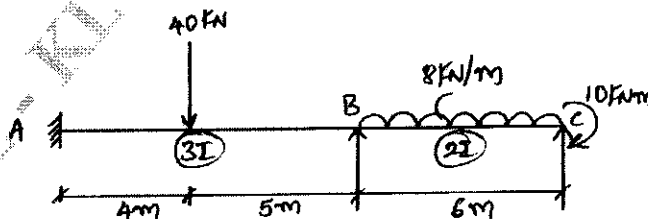


Fig.Q3

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OR

- 4 a. Analyse the rigid frame shown in Fig.Q4 by force transformation method.

(16 Marks)

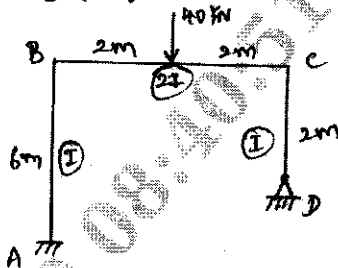


Fig.Q4

**Module-3**

- 5 Analyse the continuous beam by displacement transformation method. Draw BMD, SFD and elastic curve. Refer Fig.Q5.

(16 Marks)

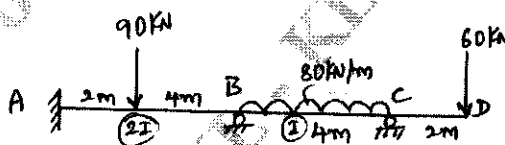


Fig.Q5

OR

- 6 Determine the support moments for the rigid frame shown in the Fig.Q6. Use element stiffness matrix method. Draw BMD and elastic curve.  $EI$  is constant.

(16 Marks)

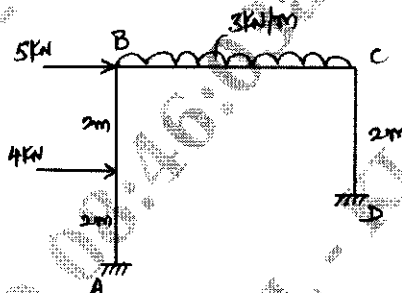


Fig.Q6

**Module-4**

- 7 A triangular plane truss shown in Fig.Q7, has cross sectional area of  $3500 \text{ mm}^2$  for all the members. The member AB was found to be 5 mm shorter than the correct length at the time of assembling. Find the forces in all the members, if the member AB is forced in position. Use force transformation method. Take member AB as redundant. Take  $E = 210 \text{ GPa}$ .

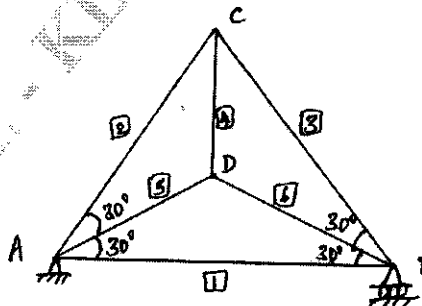


Fig.Q7

(16 Marks)

OR

- 8 The top and bottom surfaces of the continuous beam shown in the Fig.Q8 are heated to 20°C and 10°C, respectively. Determine the final support moments using element stiffness method.  $E = 2 \times 10^5 \text{ N/mm}^2$  and  $\alpha = 1.2 \times 10^{-5} / ^\circ\text{C}$ . The depths of members AB and BC are 400mm and 200mm respectively. (16 Marks)

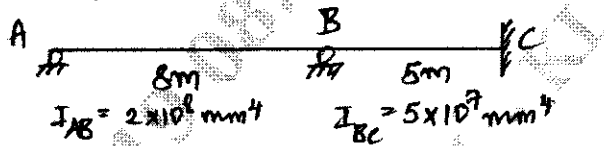


Fig.Q8

**Module-5**

- 9 Analyse the continuous beam shown in Fig.Q9 by direct stiffness method. Draw BMD and SFD. (16 Marks)



Fig.Q9

OR

- 10 Determine the forces in all the members of the plane truss shown in the Fig.Q10 by direct stiffness method. AE is constant. (16 Marks)

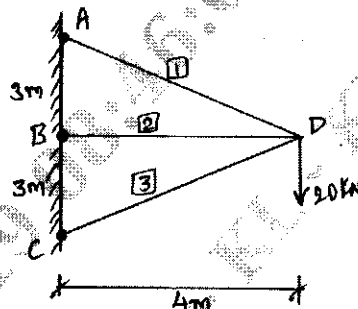


Fig.Q10

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15CV653

## Sixth Semester B.E. Degree Examination, June/July 2019 Alternative Building Materials

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 for alternate building materials. (06 Marks)  
b. Discuss about green building concepts. (10 Marks)

OR

- 2 a. Explain about Rainwater harvesting and list the methods, merits and demerits. (08 Marks)  
b. What are the commonly used environment friendly and cost effective building technologies? Explain any two. (08 Marks)

### Module-2

- 3 a. What are the alternatives for conventional stone and bricks in masonry? (04 Marks)  
b. List out the characteristics of concrete blocks. (04 Marks)  
c. Explain the process of making stabilized mud blocks. (08 Marks)

OR

- 4 a. List out the requirements of mortar. (04 Marks)  
b. What are the factors affecting compressive strengths of the masonry? (04 Marks)  
c. A brick masonry prism is made up of 5 bricks joined by mortar of thickness 20mm. The brick is 75mm in thickness. The prism is subjected to a uniform vertical stress of  $4.0 \text{ N/mm}^2$ . The brick has a modulus of  $500 \text{ N/mm}^2$  and mortar has a modulus of  $8000 \text{ N/mm}^2$ . Determine the horizontal lateral stress in brick and mortar. Take  $\mu_b = 0.1$  and  $\mu_m = 0.15$ . (08 Marks)

### Module-3

- 5 a. Discuss about different sources of lime stones. (04 Marks)  
b. Name the different types of pozzolana materials. Explain any two in detail. (08 Marks)  
c. What is meant by GFRP? List the fibre reinforcing materials. (04 Marks)

OR

- 6 a. List the agro wastes and mention its applications in building construction. (08 Marks)  
b. What are the sources of industrial wastes? (04 Marks)  
c. Write short note on construction and demolition wastes. Mention its merits and demerits. (04 Marks)

### Module-4

- 7 a. Explain any two alternatives for wall construction with neat sketches. (08 Marks)  
b. What is meant by ferrocement? List the materials used for ferrocement and mention the application of ferrocement. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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OR

- 8 a. Write the concepts of filler slab method and explain any two methods in detail. (08 Marks)  
b. Write short notes on:  
(i) Composite beam and panel roofs (03 Marks)  
(ii) Construction of masonry domes and vaults. (05 Marks)

Module-5

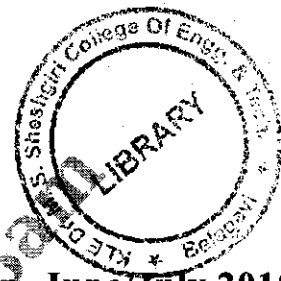
- 9 Briefly explain about:  
a. Types of machines used for manufacture of concrete (08 Marks)  
b. Methods of production of precast elements. (08 Marks)

OR

- 10 a. Explain the cost saving techniques in planning design and construction. (08 Marks)  
b. Write the difference between conventional and alternative building materials. (08 Marks)

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15CV661

## Sixth Semester B.E. Degree Examination, June/July 2019 Water Resource Management

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Write a detailed note on availability of 'Global Water Resources' and distribution of 'Global Fresh Water'. (08 Marks)
- b. Explain 'Major', 'Medium' and 'Minor' water basins in India and list a minimum of six major water basins identified in our country. (08 Marks)

OR

- 2 a. Explain water balance equation and its importance. (08 Marks)
- b. Explain the process of 'Hydrologic Cycle' along with representative diagram. (08 Marks)

### Module-2

- 3 a. Explain in detail the necessity of water resources planning and management. (08 Marks)
- b. Write a detailed note on post planning and management issues to be addressed in case of a river valley development project. (08 Marks)

OR

- 4 a. What are the planning and management aspects in case of water resource development project? (06 Marks)
- b. Explain in detail the following:  
i) Top-down approach of water resource planning and management.  
ii) Demand based bottom-up approach of water resource management. (10 Marks)

### Module-3

- 5 a. Analyze the four basic principles of "Integrated Water Resources management" recommended as per Dublin's International conference on 'Water and Environment' (1992). (10 Marks)
- b. Comment on the 'Role of Government' in providing 'Enabling Environment' for achieving integrated water resource management in our country. (06 Marks)

OR

- 6 a. Bring out the advantages/disadvantages of private sector involvement in the field of water resources management. (08 Marks)
- b. Explain the process of 'integrated water resources management' involving integration of natural water system and human system. (08 Marks)

### Module-4

- 7 a. Elaborate the salient features included in the 'National Water Policy (2002)' and discuss the water sector reforms needed to be adopted in India. (10 Marks)
- b. Discuss the role of 'Water user associations' and its effectiveness for effective water governance and management of water resources. (06 Marks)

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OR

- 8 a. Write a detailed note on existing legal framework for water and constitutional provisions for water usage by the citizens of India. (08 Marks)
- b. Elaborate the role of local institutions and its importance for good water governance. (08 Marks)

Module-5

- 9 a. Define the term 'Rain Water Harvesting'. Elaborate Rural technological systems being adopted for water conservation. (08 Marks)
- b. Explain the design principles for small water harvesting structures for a micro catchment. (08 Marks)

OR

- 10 a. What is ground water recharge? With neat sketches explain  
i) Basin method and ii) Pit method of Ground Water recharge. (10 Marks)
- b. Explain the importance of water harvesting and conservation along with basic principles involved in the process. (06 Marks)

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15CV663

## Sixth Semester B.E. Degree Examination, June/July 2019 Numerical Methods and Applications

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Solve  $x^3 + 2x^2 + 10x - 20 = 0$  by Newton-Raphson method with initial approximation as 1.2. Carryout calculations upto 4 decimals. (08 Marks)
- b. Solve the following system of linear simultaneous equations by Gauss-Elimination method.
- $$\begin{aligned} 3x + y - z &= 3 \\ 2x - 8y + z &= -5 \\ x - 2y + 9z &= 8. \end{aligned}$$
- (08 Marks)

OR

- 2 a. Apply Gauss – Seidel method upto 5 iterations to solve the following equations. Use initial approximation as (0, 0, 0).
- $$\begin{aligned} 2x_1 - x_2 + x_3 &= 5 \\ x_1 + 3x_2 - 2x_3 &= 7 \\ x_1 + 2x_2 + 3x_3 &= 10. \end{aligned}$$
- (08 Marks)
- b. Using Gauss-Jordan method, find the inverse of the matrix 'A'.
- $$A = \begin{bmatrix} 2 & 2 & 3 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{bmatrix}.$$
- (08 Marks)

### Module-2

- 3 a. Fit a polynomial of degree three using Newton's forward differences formula for the following values.

x:	3	4	5	6
y:	6	24	60	120

(08 Marks)

- b. Use Lagrange's interpolation formula to fit a polynomial to the following data. Hence find  $y(-2)$ .

x:	-1	0	2	3
y:	-8	3	1	2

(08 Marks)

OR

- 4 a. Find Newton's divided differences polynomial for the data in the polynomial.

x:	-3	-1	0	3	5
f(x):	-30	-22	-12	330	3458

(08 Marks)

- b. The following values of x and y are given. Find the cubic splines. Hence evaluate  $y(1.5)$ . Take  $M_0 = M_3 = 0$ .

x:	1	2	3	4
y:	1	2	5	11

(08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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**Module-3**

- 5 a. Evaluate  $\int_0^{10} \frac{dx}{1+x^2}$  using both trapezoidal and Simpson's 1/3<sup>rd</sup> rule. Take  $h = 1$ . (08 Marks)
- b. The following data gives the velocity of a particle for 20 seconds at an interval of 5 seconds. Find the initial acceleration using entire data :

Time 't' (sec)	0	5	10	15	20
Velocity 'V' (m/s)	0	3	14	69	228

(08 Marks)

**OR**

- 6 a. Evaluate  $\int_0^1 \frac{dx}{1+x}$  correct to three decimal places using Romberg's method. Use trapezoidal rule to evaluate the integral. (08 Marks)
- b. Using three point Gaussian quadrature formula, evaluate  $\int_{0.2}^{1.5} e^{-x^2} dx$ . (08 Marks)

**Module-4**

- 7 a. Using fourth order Runge – Kutta method, solve  $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$  with  $y(0) = 1$  at  $x = 0.2$  and  $0.4$ . (08 Marks)
- b. Given  $\frac{dy}{dx} = x^2(1+y)$  and  $y(1) = 1$ ,  $y(1.1) = 1.233$ ,  $y(1.2) = 1.548$ ,  $y(1.3) = 1.979$ , evaluate  $y(1.4)$  by Adams – Bashforth method. (08 Marks)

**OR**

- 8 a. Using modified Euler's method, find  $y(0.2)$ . Given  $y' = y + e^x$ ,  $y(0) = 0$ . Take  $h = 0.2$ . (08 Marks)
- b. Using Milne's method find  $y(4.5)$ , given  $5xy' + y^2 - 2 = 0$ . Given  $y(4) = 1$ ,  $y(4.1) = 1.0049$ ,  $y(4.2) = 1.0097$ ,  $y(4.3) = 1.0143$ ,  $y(4.4) = 1.0187$ . (08 Marks)

**Module-5**

- 9 Given the values of  $u(x, y)$  on the boundary of the square in Fig.Q9, evaluate the function  $u(x, y)$  satisfying the Laplace equation  $\nabla_u^2 = 0$  at the pivotal points of this figure in Fig.Q9. Use Gauss-Seidel method for iterative calculations. (16 Marks)

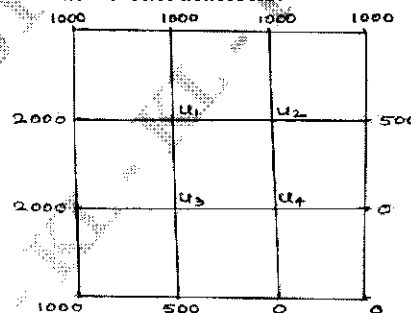


Fig.Q9

**OR**

- 10 a. Given the general classification of second order partial differential equations. (06 Marks)
- b. Solve  $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$  in  $0 < x < 5$ ,  $t \geq 0$ . Given that  $u(x, 0) = 20$ ,  $u(0, t) = 0$ ,  $u(5, t) = 100$ . Compute 'u' for the time step with  $h = 1$  by Crank–Nicholson method. (10 Marks)

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15CV71

## Seventh Semester B.E. Degree Examination, June/July 2019 Municipal and Industrial Waste Water Engineering

Time: 3 hrs.

Max. Marks: 80

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Any missing data can be assumed.*

### Module-1

- 1 a. Define sanitation. Mention advantages and disadvantages of different methods of sewage disposal. (08 Marks)  
b. Name different types of sewage system with their advantages and disadvantages. (08 Marks)

OR

- 2 a. With sketch explain shapes of sewers. (08 Marks)  
b. Draw a neat plan showing house drainage connections with labeling parts. (08 Marks)

### Module-2

- 3 a. What is self purification of stream? With sketch, explain oxygen sag curve. (08 Marks)  
b. With sketch explain zones of purification. (08 Marks)

OR

- 4 a. What is sewage sickness? Mention methods used to prevention of sewage sickness? (08 Marks)  
b. A wastewater effluent of 560 l/sec with BOD = 50 mg/l, dissolved oxygen = 3.0 mg/l and temperature of 23°C enters a river where the flow is 28 m<sup>3</sup>/sec and BOD = 4.0 mg/l, D.O = 8.2 mg/l and temperature is 17°C. K<sub>1</sub> of the waste is 0.1 per day at 20°C. The velocity of water in the river downstream is 0.18 meter/sec and depth of 1.20 mts. Determine following after mixing of waste water with the river (i) Combined discharge (ii) BOD (iii) D.O (iv) Temperature. (08 Marks)

### Module-3

- 5 a. Draw a flow diagram of municipal waste water treatment plant with their operation units. (08 Marks)  
b. Briefly explain characteristics of domestic waste water. (08 Marks)

OR

- 6 a. List the difference between activated sludge process and trickling filters. (08 Marks)  
b. With sketch explain grit chamber and skimming tank. (08 Marks)

### Module-4

- 7 a. Mention the differences between domestic waste water and industrial waste water. (08 Marks)  
b. Write note on:  
i) Volume reduction  
ii) Strength reduction  
iii) Neutralization  
iv) Equalization (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. What are the merits and demerits of municipal and industrial waste water combined treatment methods. (08 Marks)
- b. Briefly explain methods used to removal of organic and inorganic salts from waste water. (08 Marks)

Module-5

- 9 a. Explain with flow diagram, treatment option for distilleries plant. (08 Marks)
- b. With the help of flow chart, mention sources and characteristics of waste water from tannery. (08 Marks)

OR

- 10 a. Explain with flow diagram, treatment option for sugar mills. (08 Marks)
- b. With the help of flow chart, mention sources and characteristics of waste water from pharmaceutical industry. (08 Marks)

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# CBCS SCHEME



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15CV72

## Seventh Semester B.E. Degree Examination, June/July 2019 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, IS3370, SP(6)-steel tables is permitted.  
3. Any missing data may be assumed suitably.*

### Module - 1

- 1 a. Name the different types of retaining walls. (04 Marks)  
b. Design a combined footing for two interior columns carrying axial loads 1000kN and 1200kN. Column A is 400mm × 400mm in size and column B is 450mm in diameter. They are reinforced with 20mm bars and are spaced 4m centre to centre as for a bearing capacity of the soil is 120 kN/m<sup>2</sup>. Use M20 mix and Fe 415 grade steel. Sketch it. (36 Marks)

OR

- 2 a. Name the different classification of liquid retaining structures. (04 Marks)  
b. Roof of a 8m wide hall is supported on a portal frame spaced at 4m intervals. The height of the portal frame is 4m. The continuous slab is 120mm thick. Live load of roof is 1.5 kN/m<sup>2</sup>, SBC of soil is 150 kN/m<sup>2</sup>. The columns are connected with a plinth beam and the base of the column may be assumed fixed. Design the slab, column, beam members for the columns of the portal frame. Use M20 and Fe415 grade steel. Sketch the details. (36 Marks)

### Module - 2

- 3 a. Name any 4 various types of roof trusses. (04 Marks)  
b. Design a welded plate girder for an effective span of 20m to support a Udl of 80 kN/m in addition to a pair of point loads of 870 kN each of 5m from end of beam (10m apart @ center). Design the plate girder. (36 Marks)

OR

- 4 a. What are the advantages of plate girder over trusses? (04 Marks)  
b. Design a simply supported crane girder for the following data. The girder is electrically operated. Take yield stress of steel as 250MPa.  
i) Span of the crane girder = 20m  
ii) Span of the gantry girder = 7m  
iii) Capacity of the crane = 250kN  
iv) Self weight of crane excluding crab = 200kN  
v) Weight of crab = 60kN  
vi) Wheel base distance = 3.4m  
vii) Minimum hook approach = 1.1m  
viii) Self weight of rail = 0.3 kN/m  
ix) Height of rail = 75mm. (36 Marks)

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# CBCS SCHEME

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15CV73

## Seventh Semester B.E. Degree Examination, June/July 2019 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. Define precipitation. Explain various forms of precipitation. (05 Marks)  
b. Explain with a neat sketch, Symon's rain gauge. (06 Marks)  
c. Rain gauge station 'X' did not function for a part of a month during which a storm occurred. The storm produced rain fall of 84, 70 and 96 mm at three surrounding station's A, B and C respectively. The normal annual rainfalls at the stations X, A, B and C are respectively 770, 882, 736 and 944 mm. Estimate the missing rainfall at station X. (05 Marks)

OR

- 2 a. Explain Horton's engineering representation of hydrologic cycle, with a neat sketch. (08 Marks)  
b. Describe double mass curve techniques used to check consistency of rainfall data and adjust rainfall records. (08 Marks)

### Module-2

- 3 a. Define evaporation, with a neat sketch, explain measurement of evaporation using ISI standard pan. (08 Marks)  
b. Distinguish between the potential and actual evapotranspiration. (04 Marks)  
c. Explain the factors affecting infiltration capacity. (04 Marks)

OR

- 4 a. Explain how the evapotranspiration can be estimated using the Blaney - Criddle method. (05 Marks)  
b. With the neat sketch, explain double ring infiltrometer. (05 Marks)  
c. A seven hour storm produced the following rainfall intensities (in mm/hr) at half an hour interval over a basin of area 1830 km<sup>2</sup>.  
4, 9, 20, 18, 13, 11, 12, 2, 8, 16, 17, 13, 6 and 1  
If the corresponding observed run off is 36.6 million m<sup>3</sup>, estimate the  $\phi$  - index for the storm. (06 Marks)

### Module-3

- 5 a. Define runoff. Enlist the factors affecting runoff. (04 Marks)  
b. Describe any two methods of separating the base flow from total runoff. (04 Marks)  
c. The ordinates of 4h UH in m<sup>3</sup>/sec is given at a time interval of 2h after separating from the base flow :  
0, 12.52, 21.32, 23.54, 17.84, 14.79, 12.18, 10.04,  
8.26, 6.51, 4.98, 3.95, 3.05, 2.26, 1.60, 1.07, 0.53, 0  
Derive the 8h unit hydrograph. (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. Define unit hydrograph. What are the assumptions underlying the unit hydrograph theory? How do they limit the applicability of unit hydrograph? (08 Marks)
- b. Given below are the ordinates of a 4h unit hydrograph of a basin in  $m^3/sec$  at one hour intervals :  
4, 25, 44, 60, 70, 61, 52, 45, 38, 32, 27, 22, 18, 14, 11, 8, 6, 4, 2, 1.  
Construct the s-curve hydrograph using the 4h UH. Hence, derive the 2 hour unit hydrograph. Area of the basin is  $195.84 km^2$ . (08 Marks)

Module-4

- 7 a. Define the term irrigation. Briefly describe the factors which necessitate the irrigation. (04 Marks)
- b. Write a note on : flow and lift irrigation. (04 Marks)
- c. Explain in detail irrigation efficiency and add a note on crop seasons of India. (08 Marks)

OR

- 8 a. Define : duty, delta and base period. Derive the relationship between them. (05 Marks)
- b. Write a note on Bandhora irrigation. (03 Marks)
- c. A water course has culturable commanded area of 2600 hectares, out of which the intensities of irrigation for perennial sugar – cane and rice crops are 20% and 40% respectively. The duty for these crops at the head of water course are 750 hectares/cumes and 1800 hectares/cumes respectively. Find the discharge required at the head of water course if the peak demand is 120% of the average requirement. (08 Marks)

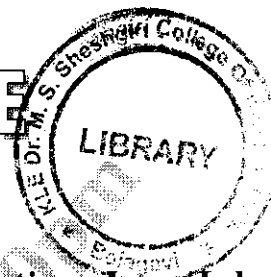
Module-5

- 9 a. Define canal. Explain different types of canal based on alignment. (08 Marks)
- b. What is meant by design of canal? Bring out the difference between Kennedy's and lacey's theory. (08 Marks)

OR

- 10 a. With a neat sketch, explain zones of storage in a reservoir. (08 Marks)
- b. 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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15CV742

## Seventh Semester B.E. Degree Examination, June/July 2019 Ground Water 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. Explain the significance of ground water compare to surface water. (04 Marks)
- b. Explain the perched aquifer with neat sketches. (04 Marks)
- c. Define the vertical distribution of ground water with neat sketches. (08 Marks)

OR

- 2 a. Describe confined and unconfined aquifers with neat sketches. (12 Marks)
- b. Define the following:
 

i) Aquifer	ii) Aquifuge
iii) Aquiclude	iv) Aquitard

(04 Marks)

### Module-2

- 3 a. Describe the Darcy's law with neat sketches. (10 Marks)
- b. An artesian aquifer 20 m thick has a porosity of 20% and bulk modulus of compression  $10^8$  N/m. Estimate the storage coefficient of the aquifer. What fraction of this is attributable to the expansibility of water? Unit weight of water is  $9810$  N/m<sup>3</sup>. Bulk modulus of elasticity of water,  $K_w = 2.1$  GN/m<sup>2</sup> =  $2.1 \times 10^9$  N/m<sup>2</sup>. (06 Marks)

OR

- 4 a. Explain the following:
 

i) Porosity	ii) Specific yield
iii) Specific retention	iv) Transmissibility

(08 Marks)
- b. An aquifer has an average thickness of 60 m and an areal extent of 100 ha. Estimate the available ground water storage if
  - i) The aquifer is unconfined and the fluctuation in ground water table is observed as 15 m.
  - ii) The aquifer is confined and the piezometric head is lowered by 50 m which drains half the thickness of the aquifer. Assume a storage coefficient of  $2 \times 10^{-4}$  and a specific field of 16%. (08 Marks)

### Module-3

- 5 a. Describe steady radial flow in unconfined aquifer. (08 Marks)
- b. A 30 cm well fully penetrates a confined aquifer 30 m deep. After a long period of pumping at a rate of 1200 lpm, the draw down in the wells at 20 and 45 m from the pumping well are found to be 2.2 and 1.8 m respectively. Determine the transmissibility of the aquifer. What is the drawdown in the pumped well? (08 Marks)

OR

- 6 a. Explain Chow's method in un-steady radial flow into a well. (08 Marks)
- b. A 30 cm well penetrates 50 m below the static water level. After a long period of pumping at a rate of 1800 lpm. The drawdown in the wells at 15 and 45 m from the pumped well were 1.7 and 0.8 m 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. Describe ground water exploration using seismic method. (10 Marks)  
b. Write short notes on:  
i) Electrical logging  
ii) Sonic logging (06 Marks)

OR

- 8 a. Describe ground water exploration using electrical resistivity method. (10 Marks)  
b. Write short notes on:  
i) Radioactive logging  
ii) Induction logging (06 Marks)

**Module-5**

- 9 a. Describe the construction of Dug well with neat sketches. (08 Marks)  
b. Describe the different types of shallow based wells. (08 Marks)

OR

- 10 a. Write short notes on:  
i) Cable tool method (04 Marks)  
ii) Diamond drilling  
b. Describe the different methods for water harvesting recharge structures. (12 Marks)

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## Seventh Semester B.E. Degree Examination, June/July 2019 Structural Dynamics

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Define: i) Oscillation  
                    iii) Free and forced vibration
- ii) Vibration  
                    iv) Resonance (06 Marks)
- b. The vibration of an elastic system consisting of a weight,  $W = 200$  N and a spring with stiffness  $k = 15$  N/mm is to be damped with viscous damping so that the ratio of two successive amplitude is 1.0 to 0.75. Determine:
- i) Natural frequency  
ii) Damping ratio and damping coefficient  
iii) Amplitude after 10<sup>th</sup> oscillation if the first amplitude of free vibration is 5 mm. (10 Marks)

**OR**

- 2 a. Explain the logarithmic decrement and derive the expression for the same. (06 Marks)
- b. A damped spring mass system has mass of 0.1 tonne, stiffness of 10 kN/m and damping coefficient 700 N-sec/m. Determine undamped, damped frequency and period of oscillation. If mass is subjected to the initial displacement of 40 mm and velocity of 500 mm/s. What is the displacement at 1 sec? Also calculate velocity at 2 sec. (10 Marks)

### Module-2

- 3 a. Explain the dependence of transmissibility on frequency ratio and the damping ratio with a qualitative graph relating to all the above three quantities. What is the range of frequency ratio for which the isolation is effective? (08 Marks)
- b. A machine weighing 600 N is supported by spring of stiffness  $K = 20$  N/mm and damper of damping coefficient,  $C = 0.01$  N-Sec/mm. A harmonic force of amplitude 20 N is applied. Compute the resonant amplitude. (08 Marks)

**OR**

- 4 a. A radio set of mass 20 kg is to be isolated from a machine vibrating with an amplitude of 0.05 mm at 500 cycles per minute (Cpm). The radio set is mounted on four isolators, each having a spring constant of 31400 N/m and damping of 392 N-sec/m. Determine the amplitude of vibration of radio set. (08 Marks)
- b. Derive the expression for Duhamul's integral as an expression for response due to general dynamic loading. (08 Marks)

### Module-3

- 5 For the shear building shown in Fig.Q5. Compute the natural frequencies and mode shapes. Also draw the mode shapes.

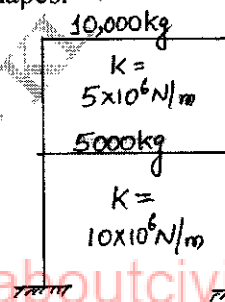


Fig.Q5

(16 Marks)

OR

- 6 A two degree freedom system shown in Fig.Q6 has mass  $m_1 = 2 \text{ kg}$ ,  $m_2 = 2 \text{ kg}$ ,  $k_1 = 40 \text{ N/m}$ ,  $k_2 = 20 \text{ N/m}$ . Determine two natural frequencies of vibration and mode shapes.

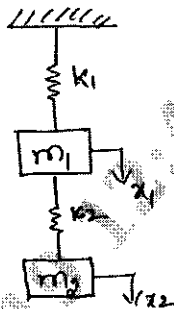


Fig.Q6

(16 Marks)

**Module-4**

- 7 Compute the response due to harmonic loading for the shear frame shown in Fig.Q7. Given  $EI = 24 \times 10^6 \text{ N-m}^2$ ,  $m = 500 \times 10^3 \text{ N-S}^2/\text{m}$ ,  $P_1(t) = 0$ ,  $P_2(t) = (10000 \sin 30 t) \text{ kN}$ , storey height = 3 m.

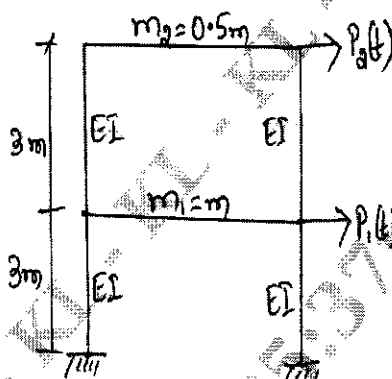


Fig.Q7

(16 Marks)

OR

- 8 Compute the response due to harmonic loading for the shear building shown in Fig.Q8.

Given:  $[K] = \begin{bmatrix} 45 \times 10^6 & -30 \times 10^6 \\ -30 \times 10^6 & 30 \times 10^6 \end{bmatrix} \text{ N/m}$       $[m] = \begin{bmatrix} 85 \times 10^3 & 0 \\ 0 & 60 \times 10^3 \end{bmatrix} \text{ kg}$

$[C] = \begin{bmatrix} 175.23 & -75 \\ -75 & 118.28 \end{bmatrix} \times 10^3 \text{ N-s/m}$       $w_n = \begin{Bmatrix} 9.714 \\ 30.58 \end{Bmatrix} \text{ rad/s}$

$[\phi]_1 = \begin{bmatrix} 0.81 \\ 1.00 \end{bmatrix}$       $[\phi]_2 = \begin{bmatrix} -0.87 \\ 1.00 \end{bmatrix}$

$P_1(t) = 0$ ,  $P_2(t) = (10000 \sin 30 t) \text{ N}$

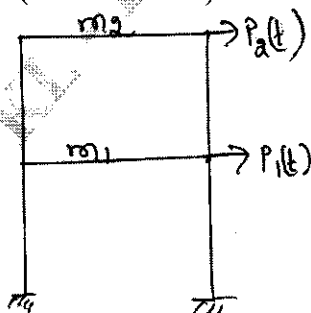


Fig.Q8

(16 Marks)





**Module-5**

- 9 a. Explain the lumped mass and consistent mass formulation for vibration of beam. (08 Marks)  
b. Derive the governing differential equation of motion for free flexural vibration of beam. (08 Marks)

OR

- 10 Compute the lowest natural frequency of simply supported beam of span 2m and mass per unit length 500 N/m.  $EI = 833.33 \times 10^9 \text{ N-mm}^2$ . Consider beam as a single element as indicated in Fig.Q10.

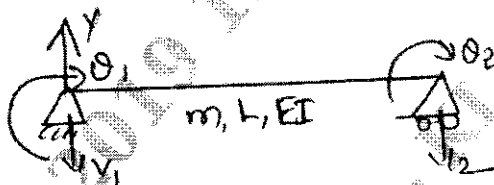
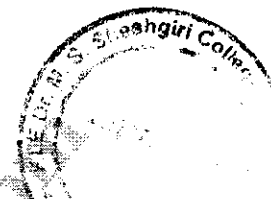


Fig.Q10

(16 Marks)

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## Seventh Semester B.E. Degree Examination, June/July 2019 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. Explain the system approach to transport planning using a flow chart. (10 Marks)  
 b. Explain the various urban transport problems. (06 Marks)

OR

- 2 a. Explain the features of BRTS. (07 Marks)  
 b. Explain briefly the travel demand. (05 Marks)  
 c. Write the types of transit system and explain any two. (04 Marks)

### Module-2

- 3 a. Explain zoning and study area. (10 Marks)  
 b. Mention the difficult types of sampling techniques. (06 Marks)

OR

- 4 a. Write a note on : (12 Marks)  
     i) Road side interviews  
     ii) Commercial vehicle surveys  
     iii) Home interview surveys.  
 b. Explain the inter relationship between income population and employment. (04 Marks)

### Module-3

- 5 a. Explain in detail the various factors governing trip generation. (08 Marks)  
 b. What is multiple linear regression analysis and mention the assumptions made. (08 Marks)

OR

- 6 a. What is trip distribution and mention the methods of trip distribution. (04 Marks)  
 b. Explain category analysis and mention the assumptions made. (04 Marks)  
 c. Let the trip rate of zone is explained by the house hold size done from field survey. If was found that the household sizes are 1, 2, 3, 4, the trip rates of the corresponding house hold is shown in the table below :

Household Size	1	2	3	4
	2	3	4	5
trips /day	3	5	7	8
	3	4	4	5
ΣY	8	12	15	18

(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. Briefly explain intervening opportunities model and competing opportunity model. (06 Marks)
- b. The total number of trips produced in and attracted to the three zones X, Y, Z of a survey area in the design year are tabulated as follows :

Zone	Trips produced	Trips attracted
X	2500	3800
Y	5800	5500
Z	4500	5500

It is known that the trip between two zones are inversely proportional to the second power of travel time between the zones, which is uniformly 20 minutes, of the trip interchange between zones Y and Z know to be 1000, calculate the trip interchange between X and Y, X and Z and Z and Y. (10 Marks)

**OR**

- 8 a. What are the factors affecting modal split? (08 Marks)
- b. Explain in detail the opportunity model relating to synthetic method. (08 Marks)

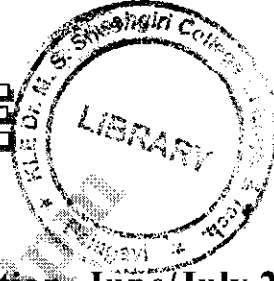
**Module-5**

- 9 a. Define trip assignment and explain the various application of the trip assignment. (10 Marks)
- b. Mention the different assignment techniques. (06 Marks)

**OR**

- 10 a. Write a brief note on diversion curves. (10 Marks)
- b. Explain in detail the features of Lowry model. (06 Marks)

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15CV753

## Seventh Semester B.E. Degree Examination, June/July 2019 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 a. Define following :  
i) Repair ii) Retrofitting iii) Rehabilitation iv) Deterioration. (04 Marks)  
b. Explain the mechanism of deterioration of concrete structures. (06 Marks)  
c. Define Distress. Explain the types of distress in concrete structures. (06 Marks)

OR

- 2 a. Explain physical and chemical causes and effects of deterioration of concrete with flow chart. (08 Marks)  
b. Write a short on sulphate attack. (04 Marks)  
c. Write the external and internal factors contributing to corrosion in concrete structure. (04 Marks)

### Module-2

- 3 a. Explain plastic shrinkage cracks in concrete structure. (06 Marks)  
b. Brief the damage assessment procedure with help of flow chart. (10 Marks)

OR

- 4 a. List the destructive, Non-Destructive and semi-destructive testing system on concrete structure. (08 Marks)  
b. Explain the causes of surface cracking after hardening concrete with help of flow chart. (08 Marks)

### Module-3

- 5 a. Explain the influence of design and construction errors on durability of concrete. (05 Marks)  
b. Explain the corrosion mechanism in reinforced concrete structure with the help of sketch. (08 Marks)  
c. Write a short note on corrosion inhibitors. (03 Marks)

OR

- 6 a. Explain the effects of cover thickness and cracking on durability of concrete. (08 Marks)  
b. Explain the methods of corrosion protection in concrete structures. (08 Marks)

### Module-4

- 7 a. Explain the importance of maintenance needs for retrofitting technique. (04 Marks)  
b. List the types of jacking technique. Explain the RCC jacking system for beam and column with sketch. (12 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. Define maintenance. Explain types of maintenance. (06 Marks)  
b. Brief the near surface mounted (NSM) technique in retrofitting structures. (06 Marks)  
c. Write the advantages of shear key in jacketing technique. (04 Marks)

**Module-5**

- 9 a. Explain Guniting and shotcrete epoxy injection in concrete structure. (06 Marks)  
b. Explain the process of repairing cracks by mortar. (06 Marks)  
c. Write a short note on Resin. (04 Marks)

OR

- 10 Write a note on :  
a. Rust Elimination  
b. Concrete Chemical  
c. Sisal Fibres  
d. Cathodic Protection. (16 Marks)

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# CBCS SCHEME

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15CV81

## Eighth Semester B.E. Degree Examination, June/July 2019 Quantity Surveying and Contracts Management

Time: 3 hrs.

Max. Marks: 80

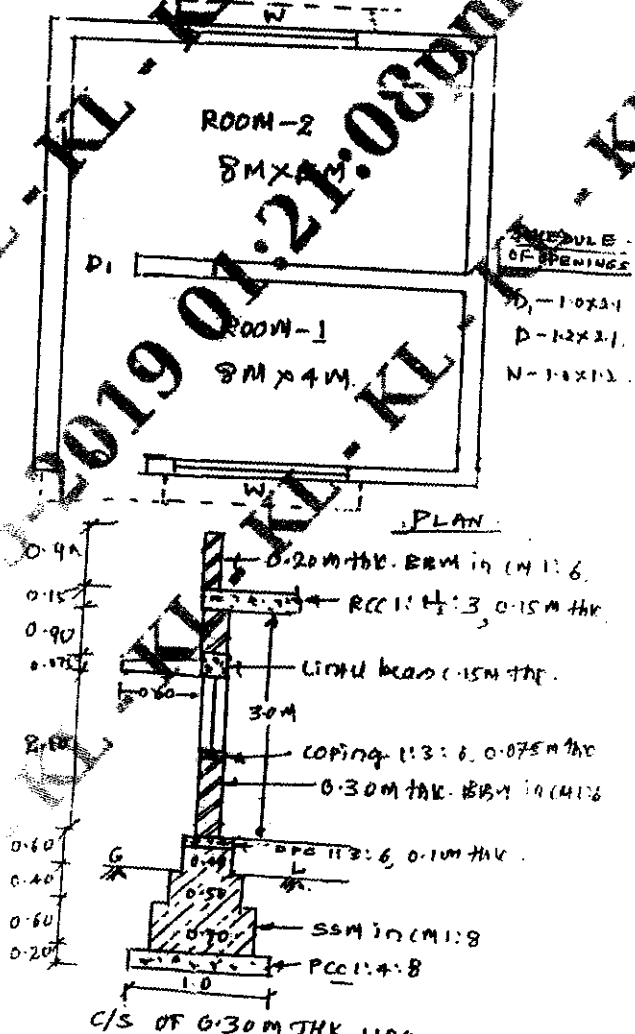
*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

1 The details of the two room building are shown in the Fig.Q.1. Estimate the quantities and cost of the following items of works:

- i) Earth work excavation for foundation in ordinary soil at Rs.300/m<sup>3</sup>.
- ii) Cement concrete bed 1:4:8 for wall foundation at Rs.2500/m<sup>3</sup>
- iii) SSM (Size Stone Masonry) in CM 1:8 for footings and basement foundation at Rs.1800/m<sup>3</sup>
- iv) First class BBM (Burst Brick Masonry) work for super structure in CM 1:6 at Rs.2000/m<sup>3</sup>
- v) RCC 1:1:3 roof slab at Rs.3000/m<sup>3</sup>.

(16 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

- 2 What are the different types of estimates? Explain any three different types of estimation. (16 Marks)

**Module-2**

- 3 The details of septic tank are shown in the Fig.Q.3. Estimate the quantities for the following items of work and cost of abstract:

- i) Earthwork in excavation for foundation hard soil at Rs.400/m<sup>3</sup>
- ii) PCC 1:4:8 for bed concrete at Rs.2500/m<sup>3</sup>
- iii) BBM in CM 1:4 for side walls at Rs.2200/m<sup>3</sup>
- iv) RCC 1:1 $\frac{1}{2}$ :3 for cover slab at Rs.3000/m<sup>3</sup>

(16 Marks)

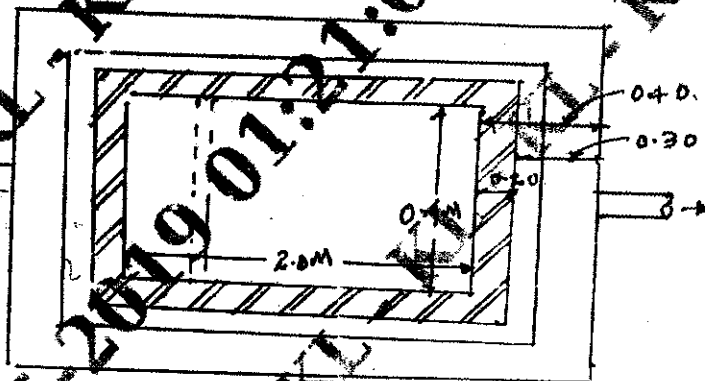
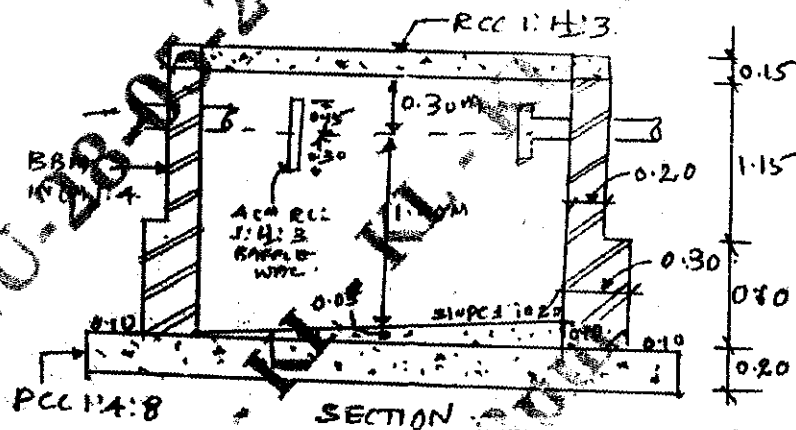


Fig.Q.3

OR

- 4 Estimate the quantities and cost of earth work for a portion of the road from the following data. Formation width of the road is 10m side slopes are 2:1 in filling and 1.5:1 in cutting. The cost of filing is Rs.180/m<sup>3</sup> and cutting Rs.120/m<sup>3</sup>.

Ch. (m)	0	40	80	120	160	200	240	280
RL of GL (m)	100.60	100.20	99.80	100.20	100.80	101.90	102.40	102.50
RL of FL (m)	101.00	← Raising Gradient 1 in 400 →						

(16 Marks)





15CV81

**Module-3**

5 Write the detailed technical specifications for the following.

- i) Earth work excavation for foundation
- ii) Burnt Brick Masonry in CM 1:6
- iii) Plastering in CM 1:6 to interior surface
- iv) RCC work proportion 1:2:4.

(16 Marks)

OR

6 Carryout the rate analysis for the following:

- i) Earth work excavation for foundation in ordinary soil
- ii) P.C.C. 1:4:8 for foundation using 40mm and down size aggregate.
- iii) Coursed rubble masonry in CM 1:6.
- iv) RCC 1:1 $\frac{1}{2}$ :3 for roof slab.

(16 Marks)

**Module-4**

7 Explain the procedure of tendering and award of works in civil engineering projects.

(16 Marks)

OR

8 What are the different types of contracts? Explain any three types of contracts.

(16 Marks)

**Module-5**

9 Write short notes about any four of the following:

- i) Performance security
- ii) Liquidated damages
- iii) Contract management
- iv) Breach of contract
- v) Mobilization and equipment advances.

(16 Marks)

OR

10 a. What is the difference between the cost, estimate and value?

(06 Marks)

b. Explain the methods of valuation.

(10 Marks)

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# CBCS SCHEME

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15CV82

## Eighth Semester B.E. Degree Examination, June/July 2019 Design of Pre-Stressed 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 is permitted.

### Module-1

- 1 a. Define pre-stressed concrete. Write any three differences between pre-tensioning and post-tensioning. (05 Marks)
- b. Explain with neat sketch Gifford Udal system of pre-stressing. (05 Marks)
- c. What is pressure line? plot the pressure line for a simply supported rectangular beam of size  $b \times h$  subjected to uniformly distributed load and pre-stressed by a force  $P$  at a constant eccentricity of  $h/6$  such that bottom fibre stress at midspan due to all loads and  $P$  equal to zero. (06 Marks)

OR

- 2 a. Explain the concept of load balancing in pre-stressed concrete design. (06 Marks)
- b. A concrete beam of symmetrical I section of simply supported span 10m has width and thickness of flange 250mm and 80mm respectively. thickness of web is 80mm and overall depth of section is 500mm. The beam is pre-stressed by a parabolic cable with an eccentricity of 150mm below centroidal axis at midspan and concentric at supports. The initial and final pre-stressing force in the cable is 250 kN and 200 kN respectively. The beam supports a live load of 3 kN/m. Calculate the fibre stress in concrete at transfer and at working loads sketch the stress distribution. (10 Marks)

### Module-2

- 3 a. List the various types of losses in pre-stressed concrete members. Explain the types of loss of pre-stress in post tensioned members only. (06 Marks)
- b. A PSC beam  $200\text{mm} \times 300\text{mm}$  is pre-stressed with wires of area  $300\text{mm}^2$  located at an eccentricity of 100mm below centroidal axis at midspan and zero at supports. Initial pre-stress in the wires is  $1\text{ kN/mm}^2$ . The span of the beam is 10m. Calculate the loss of pre-stress and total percentage of loss of pre-stress in wires if i) the beam is pre-tensioned ii) the beam is post tensioned, using the following data :  
Grade of concrete  $M_{40}$ ,  $E_s = 210\text{ kN/mm}^2$  shrinkage strain in concrete for pre tensioned member =  $300 \times 10^{-6}$ . Age of concrete at transfer for post tensioned beam = 8 days, creep coefficient = 1.6. Slip at anchorage = 2mm coefficient of friction between concrete and cable duct = 0.55. Friction coefficient for wave effect = 0.0015/m. (10 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. What are the factors affecting deflection of a PSC beam? (04 Marks)
- b. A PSC beam span supported over a span of 8m is of rectangular section of size 150mm × 300mm. The beam is pre-stressed by a parabolic cable having an eccentricity of 80mm below centriodal axis at mid span and 30mm above the centriodal axis at the ends. The initial pre-stressing force in the cable is 350 kN. The beam supports a concentrated load of 10kN at midspan and uniformly distributed load of 2 kN/m over the entire span. Grade of concrete is  $M_{40}$ . Estimate the following deflection :
- Short term deflection due to pre-stress and self weight.
  - Long-term deflection due to pre-stress, self weight and imposed loads, allowing 20% loss of pre-stress and taking creep coefficient of 1.80
  - Check the deflection as per IS 1342-1980 requirements. (12 Marks)

**Module-3**

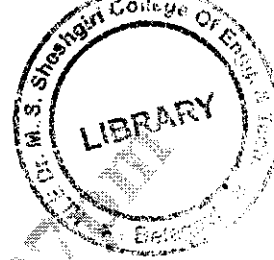
- 5 a. A post tensioned unbounded beam section 120mm × 300mm is pre-stressed by 7 wires of 5mm diameter with an effective cover of 50mm and effective stress of 1200 N/mm<sup>2</sup>. The beam is of 7.5m span. If  $M_{40}$  concrete is used and  $f_p = 1600$  MPa, find the ultimate flexural strength of the section. (08 Marks)
- b. A post tensioned bounded Tee section has a flange width of 800mm and thickness of 250mm. The thickness of web is 200mm. The area of high tensile wire is 4000 mm<sup>2</sup> located at 1200mm from top of flange. The characteristic strength of steel and concrete are 1500 N/mm<sup>2</sup> and 40 N/mm<sup>2</sup> respectively. Calculate the ultimate moment capacity of the section using IS 1343 recommendation. (08 Marks)

OR

- 6 Design a pre-stressed concrete beam as Type-1 member to carry a superimposed load of 12 kN/m over a simply supported span of 25m. The permissible stress in compression for concrete at transfer and working loads are 14 N/mm<sup>2</sup> and 12 N/mm<sup>2</sup> respectively. Initial stress in pre-stressing cable is 1000 N/mm<sup>2</sup>. Loss of pre-stress is 20%. Adopt Freyssenet cables each of 12 wires of 5 mm diameter. (16 Marks)

**Module-4**

- 7 a. Explain different methods of improving shear resistance of PSC members. (05 Marks)
- b. Explain the mechanism of shear failure in PSC beams. (05 Marks)
- c. The support section of PSC beam 120mm × 250mm is required to carry an ultimate shear force of 70kN. The compressive stress at the centriodal axis is 5MPa and  $f_{ck} = 40$  MPa,  $f_y = 415$  MPa cover to reinforcement = 50mm. Design the suitable shear reinforcement at the section as per IS - 1343 recommendation. (06 Marks)



OR

- 8 a. Differentiate between web shear, flexural and flexure shear cracks in PSC members with neat sketches. (06 Marks)
- b. A PSC beam  $300\text{mm} \times 1000\text{mm}$  is subjected to a shear force of  $500\text{kN}$  under working loads near support section. The effective pre stressing force in the tendon is  $800\text{kN}$ . The cable is parabolic with zero eccentricity at support and  $300\text{mm}$  below centroidal axis at midspan. The span of the beam is  $12\text{m}$ . If  $M_{40}$  concrete is used estimate the principal tension in concrete at support section and if required design the shear reinforcement. (10 Marks)

**Module-5**

- 9 a. Write a note on anchorage zone stresses. (05 Marks)
- b. Explain end zone reinforcement. (05 Marks)
- c. The end block of a post tensioned beam  $500\text{mm} \times 1000\text{mm}$  is pre-stressed 2 cables each comprising of 5 wires of  $7\text{mm}$  diameter. The cable is anchored by square anchor plates  $400\text{mm} \times 400\text{mm}$  with their centre located at  $250\text{mm}$  from the top and bottom edges of the beam. The jacking force in the cable is  $3000\text{kN}$ . Design a suitable anchorage zone reinforcement as per IS-1343 code provisions. (06 Marks)

OR

- 10 A pre tensioned rectangular beam of size  $120\text{mm} \times 240\text{mm}$  is simply supported over a span of  $6\text{m}$ . The beam is prestressed by tendons carrying on initial pre-stress force of  $225\text{ kN}$  at a constant eccentricity of  $40\text{mm}$ . The loss of pre-stress is assumed to be  $15\%$ . The beam is incorporated in a composite T-beam by casting a top flange of  $450\text{mm}$  wide and  $40\text{mm}$  thick. Live load on composite beam is  $8\text{kN/m}^2$ . Calculate the resultant stress developed in the beam assuming the pre tensioned beam is unpropped during casting of top flange if the modulus of elasticity of the flange portion and the pre tensioned beam are  $28\text{ kN/mm}^2$  and  $35\text{kN/mm}^2$  respectively. Also check the composite T-beam for limit state of deflection. (16 Marks)

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15CV831

## Eighth Semester B.E. Degree Examination, June/July 2019 Earthquake Engineering

Time: 3 hrs.

Max. Marks: 80

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. IS1893-2016 code is permitted.*

### Module-1

- 1 a. Explain the concept of plate tectonic theory and with a neat figure explain the concept of elastic rebound theory. (06 Marks)
- b. What are the seismic waves? Explain the significant characteristics of seismic waves. (06 Marks)
- c. How the classifications of earthquakes are made? (04 Marks)

OR

- 2 a. Explain the difference between magnitude and intensity. What are the isoseismals? (08 Marks)
- b. What are the different earthquake ground motion characteristics? (04 Marks)
- c. A seismograph located 1200km from the epicenter of an earthquake, records a maximum ground displacement of 15.6mm for surface waves having a period of 20 seconds. Determine the surface wave magnitude. (04 Marks)

### Module-2

- 3 a. Derive and plot the response for SDOF system with free vibration undamped case. (08 Marks)
- b. Derive and plot the vibration DAF with damping and frequency ratio of an SDOF system subjected to harmonic excitation. (08 Marks)

OR

- 4 a. Explain the dynamic step by step dynamic response procedure for linear acceleration method. (08 Marks)
- b. What is response spectrum? And what are the steps involved in construction of design spectrum. (08 Marks)

### Module-3

- 5 a. Explain the different vertical irregularities. (05 Marks)
- b. What are the lessons learnt with references to seismic behaviour of structural damages during past earthquakes. (05 Marks)
- c. Illustrate with the neat sketches the problems associated with the configuration of building and its possible remedial measures. (06 Marks)

OR

- 6 a. Summarize the different philosophy adopted in seismic design. (06 Marks)
- b. What are the different types of structural modules to simulate the seismic behaviour of a framed building? (05 Marks)
- c. Explain the different code-based methods for seismic design. (05 Marks)

1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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**Module-4**

- 7 For an RCC-SMRF building frame for office, the seismic weights on the floors are  $W_1(\text{roof}) = 3000 \text{ kN}$ ,  $W_2 = W_3 = W_4 = 42000 \text{ kN}$ . The storey heights are ground storey = 4.2m, other storey each of 3.2m. The building is founded on hard soil and situated in zone-IV. Find the seismic force by equivalent lateral force procedure. (16 Marks)

OR

- 8 For the RCC-SMRF frame building with importance factor = 1. Founded on soft soil and situated in Zone-V. Seismic weights on the floors are  $W_3(\text{Roof}) = 392 \text{ kN}$ ,  $W_2 = 784 \text{ kN}$ ,  $W_1 = 1568 \text{ kN}$ . Determine the seismic forces by dynamic analysis method. The free vibration results for the buildings are. (16 Marks)

Natural Period (sec)	Mode - 1	Mode - 2	Mode - 3
Roof	0.883	0.404	0.302
2 <sup>nd</sup> FL	1.000	1.000	1.000
1 <sup>st</sup> FL	0.791	0.000	-0.791
	0.250	-1.000	0.250

**Module-5**

- 9 a. Explain with neat figure of typical failure of RC framed structure. (06 Marks)  
 b. Explain with neat sketches of the ductile detailing provisions for columns as per IS-code methods. (06 Marks)  
 c. Explain the different methods of retrofitting of structures. (04 Marks)

OR

- 10 a. Explain the different elastic properties of masonry structures. (06 Marks)  
 b. Explain the major steps of the lateral load analysis of masonry building. (06 Marks)  
 c. How to make stone masonry buildings earthquake resistant. (04 Marks)

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15CV832

## Eighth Semester B.E. Degree Examination, June/July 2019 Hydraulic Structures

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Explain different types of forces acting on a gravity dam with neat sketch. (10 Marks)  
b. Explain various types of failure modes in gravity dam. (06 Marks)

OR

- 2 a. Explain step by step the analytical procedure to be adopted for analyzing the stability of gravity dam. (08 Marks)  
b. Write a note on drainage galleries. (08 Marks)

### Module-2

- 3 a. Write neat sketch of the preliminary section of Earthen dams and explain components. (08 Marks)  
b. What are the causes of failure of Earthen Dams? Explain them with relevant sketches. (08 Marks)

OR

- 4 a. Explain types of Earthen Dams. (08 Marks)  
b. Explain how to determine phreatic line with filter using Casagrande's method. (08 Marks)

### Module-3

- 5 a. What is spillway? Explain spillway components. (07 Marks)  
b. Explain:  
i) Free overfall spillway  
ii) Ogee spillway  
iii) Energy dissipation devices (09 Marks)

OR

- 6 a. Design a suitable section for the overflow portion of a concrete gravity dam having the down stream face sloping at a slope of 0.7H:1V the design. Discharge for the spillway is 8000 cumecs the height of the spillway crest is kept at RL 204.0m. The average river bed level at the site is 100 pm. The spillway length consist of 6 spans having clear width of 10m each. Thickness of each pier may be taken to be 2.5m. (10 Marks)  
b. Explain Khosla's theory and concepts of flownet. (06 Marks)

### Module-4

- 7 a. Describe the necessity of cross drainage works. (06 Marks)  
b. Explain types of cross drainage works. (10 Marks)

1 of 2

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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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OR

- 8 Design a suitable cross drainage work for following data at the crossing of a canal and a drainage.

Canal

Full supply discharge = 32 cumecs

Full supply level = RL 213.5 m

Canal bed level = RL 212.0m

Canal bed width = 20m

Trapezoidal canal section with 1.5H : 1V

Canal water depth = 1.5m

Drainage

High flood discharge = 300 cumecs

High flood level = 210.0m

High flood depth = 2.5m

Ground level = 212.5m

(16 Marks)

**Module-5**

- 9 a. Explain the main functions of head and cross regulators. (08 Marks)  
b. Explain the necessity of canal falls. (08 Marks)

OR

- 10 a. Explain the types of canal fall. (08 Marks)  
b. Explain the types of canal outlets. (08 Marks)

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## Eighth Semester B.E. Degree Examination, June/July 2019 Pavement Design

Time: 3 hrs.

Max. Marks: 80

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data, if any may be assumed.  
3. Use of relevant charts is permitted.

### Module-1

- 1 a. Draw neat sketch of cross section of a flexible pavement and describe the functions of each layer. (08 Marks)
- b. Determine the deflection values under a wheel load of 60kN and contact pressure 0.7 N/mm<sup>2</sup> in a homogeneous mass of soil at a depth of  $Z = 2.5a$  upto a radial distance of  $r = 5a$ . Take modulus of elasticity of subgrade as 8 N/mm<sup>2</sup>. Sketch the deflection curve. Use Fig.Q.1(b). (08 Marks)

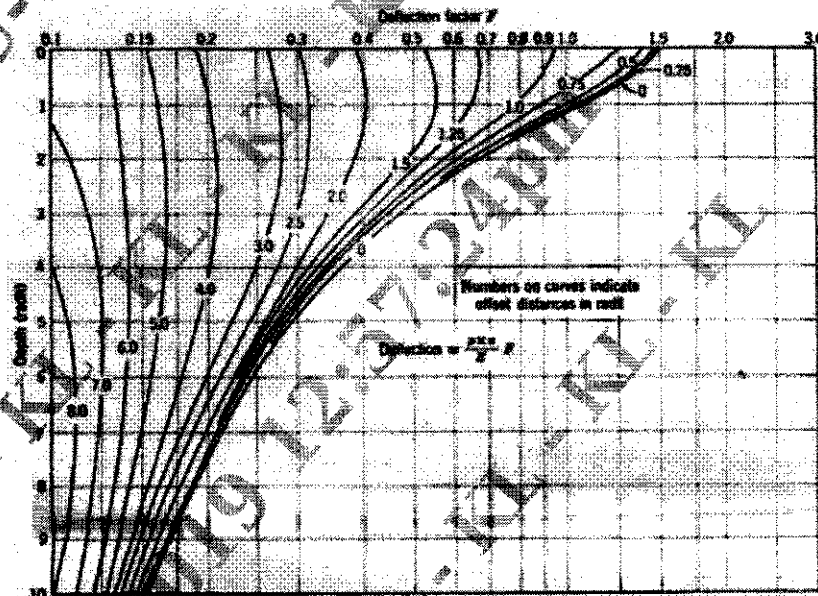


Figure Q.1(b) - Vertical Deflection  $w$  due to Circular Loading (Foster and Ahlin, 1954)

Fig.Q.1(b)

OR

- 2 a. Compare the salient features of flexible and rigid pavements. (08 Marks)
- b. A plate load test was carried out on subgrade using 300mm diameter plate and corresponding to a deflection of 5mm, the load sustained on the plate per unit area was 0.08 N/mm<sup>2</sup>. The test was repeated on base course of thickness 300mm and unit load sustained was 0.45 N/mm<sup>2</sup> at the same deflection. Find:
  - i) Elastic modulus of subgrade and the ratio  $E_P/E_S$ .
  - ii) What should be the thickness of base course as to sustain wheel load of 50kN and contact pressure 0.6 N/mm<sup>2</sup> so that maximum deflection does not exceed 5mm. Use Fig.Q.2(b). (08 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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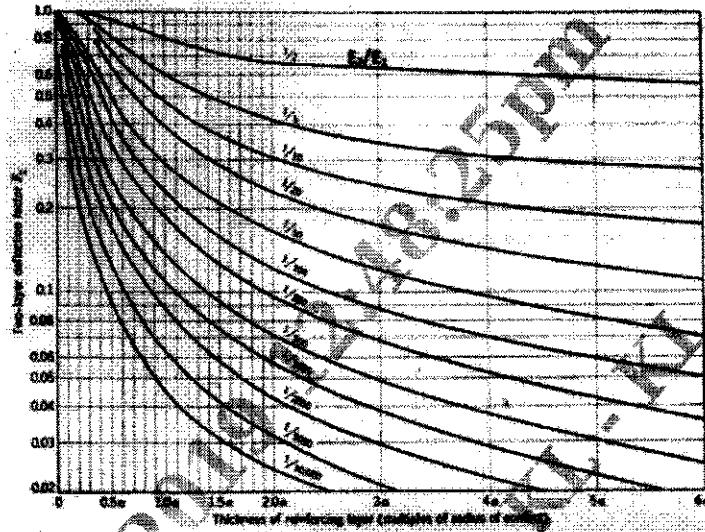


Fig.Q.2(b)

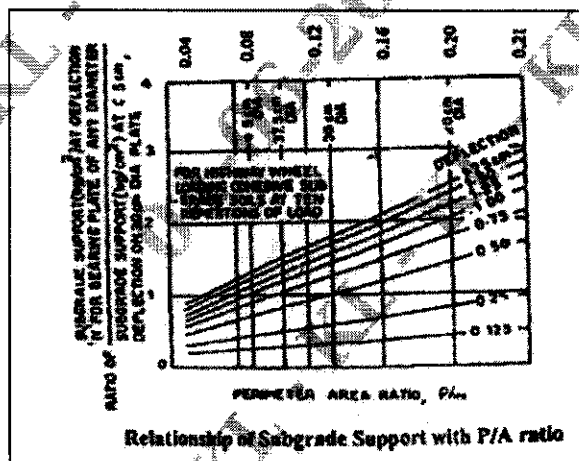
**Module-2**

- 3 a. Explain what is trust action. What are the factors affecting frost action and what are the remedial measures? (08 Marks)
- b. Explain Equivalent Wheel factor (EWL). Calculate design repetitions for 20 years period for various wheel loads equivalent to 22.68kN wheel load using the following survey data on a four lane road. (08 Marks)

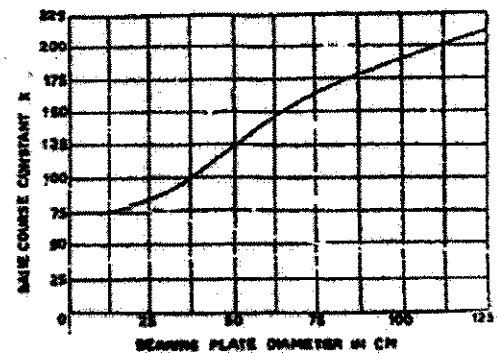
Wheel load, kN	AOT, both directions	% of traffic volume
22.68	Total volume of traffic consisting of traffic growth = 215	13.17
27.22		15.30
31.75		11.36
36.29		14.11
40.82		6.21
45.36		5.84

OR

- 4 a. Design a highway pavement using McLeod method for a wheel load of 5100 kg with tyre pressure 6.5 kg/cm<sup>2</sup>. The plate bearing test conducted on subgrade soil using 30cm diameter. Plate yielded pressure of 2.5kg/cm<sup>2</sup> after 10 load repetitions at 0.5cm deflection. What will be the pavement thickness, if design deflection is taken as 0.35cm? Use Fig.Q.4a(i) and Fig.Q.4a(ii).



Relationship of Subgrade Support with P/A ratio



Relation between Plate Diameter and Base Course Constant

Fig.Q.4a(i)

Fig.Q.4a(ii)

- b. Design the pavement by triaxial method using the following data:

Wheel load = 51 kN, radius of contact area = 150 mm

Traffic coefficient = 1.5,

Rainfall coefficient = 0.9

Design deflection = 2.5mm

E of subgrade = 10 N/mm<sup>2</sup>

E of base course = 40 N/mm<sup>2</sup>

E of 75mm thick bituminous concrete surface = 100 N/mm<sup>2</sup>.

(08 Marks)

**Module-3**

- 5 a. List the general causes of flexible pavement failures and describe the failures in sub base and base courses. (08 Marks)
- b. Explain the step by step procedure of conducting Benkleman Beam deflection studies for evaluation of flexible pavement surface condition. (08 Marks)

OR

- 6 a. Briefly explain the typical types of flexible pavement failures. (08 Marks)
- b. Existing black top pavement was tested using Benkleman beam. The observations recorded at a pavement temperature of 43°C are given below. Compute the thickness of bituminous concrete overlay taking allowable deflection as 1.25mm, factor of subgrade moisture as content as 2 and accuracy 84%.  
1.46, 1.52, 1.56, 1.76, 1.96, 1.74, 1.68, 1.74, 1.96, 1.42, 1.56, 1.62mm. (08 Marks)

**Module-4**

- 7 a. As per IRC 58-2002, explain the procedure of design of rigid pavements. (08 Marks)
- b. Calculate the wheel load stresses at edge and corner regions of a CC pavement using modified equations and the following data: wheel load = 51 kN E = 3 × 10<sup>4</sup> N/mm<sup>2</sup>  
μ = 0.15 pavement thickness = 180mm, radius of contact area = 150mm and modulus of subgrade reaction = 0.06 N/mm<sup>3</sup>. (08 Marks)

OR

- 8 a. Explain, how warping stresses are formed in cc pavements. Describe the Bradbury's equations to calculate warping stresses at critical locations. (08 Marks)
- b. The design thickness of a CC pavement is 26cm, considering a design axel load (98<sup>th</sup> percentile load) of 12000 kg on single axel and M40 concrete with characteristic compressive strength of 400 kg/cm<sup>2</sup>, radius of relative stiffness 62.2 cm, elastic modulus of dowel (steel 2 × 10<sup>6</sup> kg/cm<sup>2</sup>, modulus of dowel concrete interaction 41500 kg/cm<sup>3</sup> and joint width 8cm, design the dowel bars for 40% load transfer considering edge loading. Take diameter of dowel bar = 3cm, spacing = 25cm. (08 Marks)

**Module-5**

- 9 a. What are the factors considered in design of rigid pavements? Explain any three factors. (08 Marks)
- b. List the typical failures in rigid pavements and explain any three of them. (08 Marks)

OR

- 10 a. With sketches, describe the various types of joints and their requirements, in rigid pavements. (08 Marks)
- b. Determine spacing between contraction joints for a 3.5m slab width having thickness of 200mm, friction 1.5, for the following two conditions:  
i) Planche cement concrete, allowable Sc = 0.08 N/mm<sup>2</sup>  
ii) Reinforced cement concrete, 10mm diameter bars at 0.3m spacing. (08 Marks)

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