B.E. (Civil Engineering) Third Semester (C.B.S.)

Applied Mathematics - III

P. Pages : 3 **NRT/KS/19/3292**

Time : Three Hours * 0 1 7 5 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
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7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Use of non programmable calculator is permitted.
10. Use of graph paper is permitted.

1. Obtain the Fourier series for **7**

$$f(x) = \begin{cases} 1+\frac{2x}{\pi}, & -\pi < x < 0 \\ 1-\frac{2x}{\pi}, & 0 < x < \pi \end{cases}$$

Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ... = \frac{\pi^2}{8}$.

OR

2. Obtain half range sine series for $f(x) = \pi x - x^2$ in the interval $(0, \pi)$. **7**

3. a) Solve: $x\left(y^2 - z^2\right)p + y\left(z^2 - x^2\right)q = z\left(x^2 - y^2\right)$. **6**

b) Solve: $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} = \cos x - \cos 2y$. **6**

c) Solve the following by method of separation of variables: **6**
$\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}$. Given $u(0, y) = 8e^{-3y}$.

OR

4. a) A tightly stretched string with fixed end points x = 0 and x = l is initially at rest in a position given by $y = y_0 \sin^3(\pi x/l)$. If it is released from rest from this position, find the displacement y (x, t). **7**

b) Solve by using method of separation of variables $3\frac{\partial u}{\partial x} - 2\frac{\partial u}{\partial y} = 0$, given that $u(x,0) = 4e^{-x}$. **5**

c) Solve $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x} + 3x^2 y$. **6**

5. Find the extremals of the functional **7**

$$V[y(x)] = \int_{x_0}^{x_1} \left[16y^2 - y''^2 + 2ye^x\right] dx .$$

OR

6. Find the curve passing through the points (x_1, y_1) and (x_2, y_2), which when rotated about x-axis gives minimum surface area. **7**

7. a) Investigate the linear dependence of the vectors $x_1 = (1, 2, 4)$, $x_2 = (2, -1, 3)$, $x_3 = (0, 1, 2)$ & $x_4 = (-3, 7, 2)$. and if possible, find relation between them. **6**

b) Reduce the matrix $\begin{bmatrix} 3 & 4 \\ 4 & -3 \end{bmatrix}$ to the diagonal form. **6**

c) Using Sylvester's theorem, verify. **6**

$\log_e e^A = A$, if $A = \begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$.

OR

8. a) Verify Cayley-Hamilton theorem and hence find A^{-1}, where $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. **6**

b) Solve by matrix method $\frac{d^2y}{dt^2} - 5\frac{dy}{dt} + 6y = 0$ given $y(0) = 2$, $y'(0) = 5$. **6**

c) Diagonalize the matrix by orthogonal transformation. **6**

$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$.

9. a) Using Newton Raphson method, find the root of the equation $x^4 - x - 9 = 0$, correct upto 3 places of decimal. **6**

b) Solve the system of equation by Gauss-Seidal Method. **6**
$4x + 11y - z = 33,\ 6x - 3y + 12z = 36;\ 8x - 3y + 2z = 20.$

c) Given $\frac{dy}{dx} = -xy^2,\ y(0) = 2,\ h = 0.1$, find y when x = 0.2, using Euler's modified method. **6**

OR

10. a) Find by False position method the root of the equation $xe^x = \cos x$. **6**

b) Solve by 4th order Runge-Kutta method $\frac{dy}{dx} = 3x + y^2$, given $y = 1.2$, when x=1, find $y(1{\cdot}1)$. **6**

c) Solve system of equation by Crout's method **6**
$4x + 11y - z = 33;\ 6x + 3y + 12z = 36;\ 8x - 3y + 2z = 20.$

11. Use Simplex method to solve the following L.P.P: **12**

Maximize $z = 5x + 3y$

s.t. $2x + 4y \le 12$

$2x + 2y = 1$

$5x + 2y \ge 10$

$x, y \ge 0$

OR

12. a) A farmer wants to make sure that his herd get the minimum daily requirement of three basic nutrient A, B, C. Daily requirement are 15 units of A, 20 units of B and 30 units of C one gram of product P has 2 units of A, 1 unit of B and 1 unit of C. One gram of product Q has 1 unit of A, 1 unit of B and 3 units of C. The cost of P is Rs. 12/gram and cost of B is. Rs. 18/gram. Formulate the l.p.p. to minimize cost. **6**

b) Solve the LPP using graphical method **6**
Minimize Z = 20 x + 10 y

s.t. $x + 2y \le 40$; $4x + 3y \ge 60$;

$3x + y \ge 3$; $x,\ y \ge 0.$

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B.E. (Civil Engineering) Third Semester (C.B.S.)

Strength of Materials

P. Pages : 3 **NRT/KS/19/3293**

Time : Three Hours * 0 1 7 6 * Max. Marks : 80

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8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Use of non programmable calculator is permitted.

1. a) Draw stress strain curve for mild steel under tension and Explain the salient points. **7**

b) A bar show in Fig. 1 (b) is subjected to tensile force. Determine the total change in length, taking $E = 2.1\times10^5\ N/mm^2$. **7**

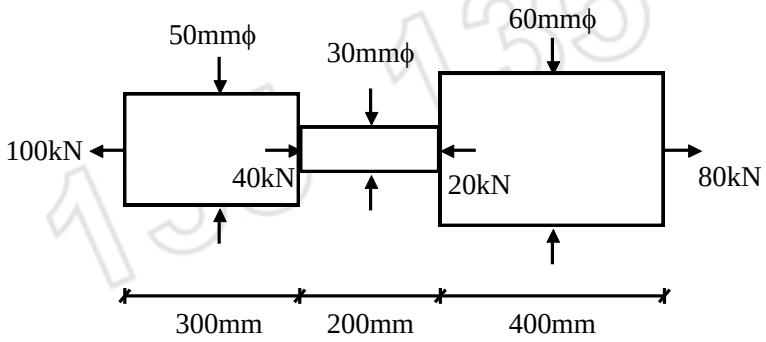

Fig. 1 (b)

OR

2. a) Derive the relation between the modulus constant E, K and G. **7**

b) A rigid bar ABCD is supported by a steel and Aluminium rod as shown in Fig. 2 (b) Determine the stresses developed in steel and aluminium. **7**

Taking $E_{st} = 2\times10^5\ N/mm^2$, $E_{AL} = 1\times10^5\ N/mm^2$. Also calculate the reaction developed at the hinge support.

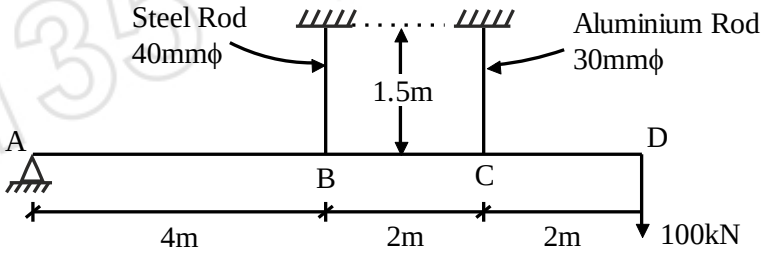

Fig. Q2 (b)

3. Draw shear force and Bending moment diagram for the Fig. 3 shown below and locate point of contraflexure. **13**

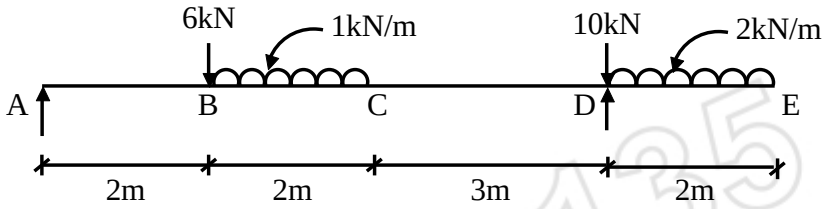

Fig. Q. 3

OR

4. Draw shear force and Bending moment diagram of given Fig. 4. **13**

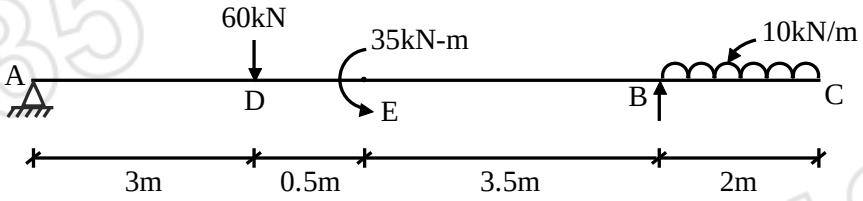

Fig. Q. 4

5. Derive the bending formula and give the assumption in theory of simple bending. **13**

OR

6. Plot the shear stress distribution for 'I' section having top flange 120×10mm, bottom flange 200×10mm with web 8×400mm. The beam is subjected to maximum shear force of 100kN. **13**

7. Derive the torsion equation and stating the assumption in pure torsion. **13**

OR

8. A solid circular shaft is to transmit 300kW at 100rpm. If the shear stress not to exceed $80\,N/mm^2$, find the diameter of the shaft what % of saving in weight would be obtained if this shaft is replaced by a hollow one whose internal diameter equals to 0.6 times the external one? The length, material and maximum shear stress being the same. **13**

9. Calculate the deflection under each point load for the beam as shown in Fig. - 9 in terms of EI. **13**

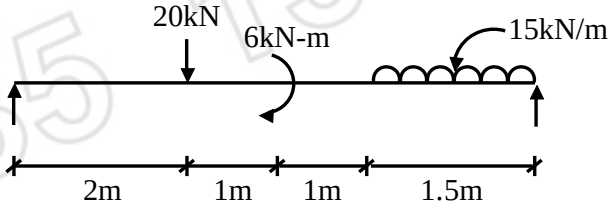

Fig Q. 9

OR

10. An overhanging beam ABC is loaded as shown in Fig. 10 Determine the deflection at point C and slope at pt C. Also calculate the maximum deflection between A and B. **13**

Take $E = 200\times10^{6}\ \text{kN}/\text{m}^2$ and $I = 24\times10^{-6}\ \text{m}^4$.

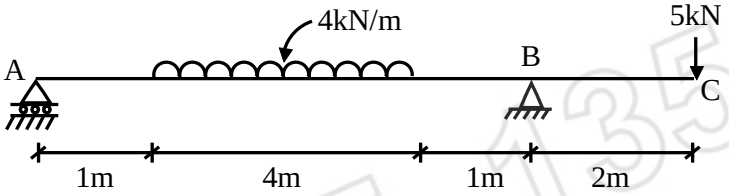

Fig Q. 10

11. The stresses at a point in a strained material are: **14**

$P_x = 60\,\text{N}/\text{mm}^2\,(\text{T})$, $P_y = 50\,\text{N}/\text{mm}^2\,(\text{C})$ and $q = 25\,\text{N}/\text{mm}^2$.

Determine analytically

i) Principal stresses magnitude and direction.

ii) Maximum shear stress.

iii) Normal and tangential stresses on a plane inclined at 25° counter clockwise with respect to a plane carrying P_x.

OR

12. A point in a strained material is subjected to the stresses as shown in Fig. 12. **14**

a) Locate the principal planes and evaluate the principle stresses.

b) Find the principal strains assuming

$\frac{1}{m} = 0.25,\ E = 2\times10^{5}\ \text{N}/\text{mm}^2$.

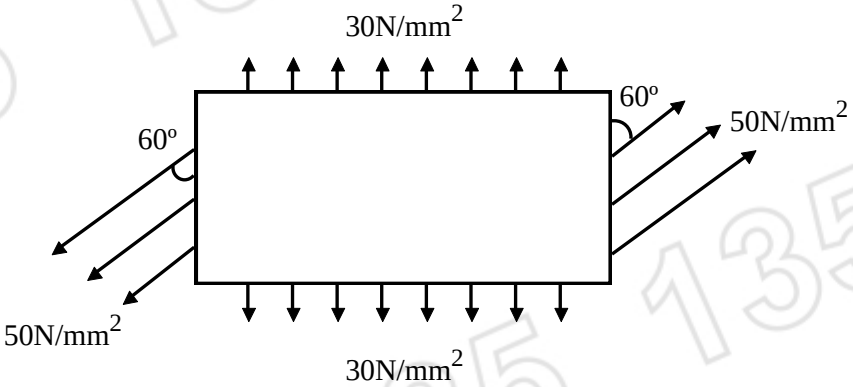

Fig. Q. 12

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B.E. (Civil Engineering) Third Semester (C.B.S.)

Environmental Engineering - I

P. Pages : 2 **NRT/KS/19/3294**

Time : Three Hours * 0 1 7 7 * Max. Marks : 80

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8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Enlist the various types of water demand. Explain the various factors affecting the water Demand. **6**

b) The population of a town in 1960, 1970, 1990 and 2,000 was 25,000, 2,8000, 34,000, 42,000, 47,000 calculate the population for the year 2010 and 2030 by Geometric in crease method. **8**

OR

2. a) What are the different source of water? Explain any two source with the help of neat sketch. **6**

b) What are the intake structure? Explain with the help of neat sketch "Canal intake". **8**

3. a) List out the various Pipe Joints used in water supply scheme and explain expansion joint & Flange joint. **6**

b) In a water supply scheme to be design for serving a population of 3 lakhs, the Storage Reservoir is situated at 6 km away from the city & loss of head from source to city is 16 m. Taking daily demand is 110 lit/capital/day. Pumping is to be done for 12 hrs only determine the size of supply main by using Darcy-Weisbach Formula. Taking coefficient of friction as 0.012. **7**

OR

4. a) Write a short note on Rising main with labeled diagram. **6**

b) Enlist various types of pump. Explain in detail centrifugal pump. **7**

5. a) Enlist physical, chemical and bacteriological characteristics of water. Explain any one. **6**

b) Draw layout of conventional water treatment plant & explain in brief function of each unit. **7**

OR

6.	a)	Design a cascade aerator for capacity of 18 m/d. Assume suitable data with a neat sketch.	**7**
	b)	Write a short notes on various types of coagulant.	**6**
7.		Design a rapid sand filter for design flow of 20 m/d. Assume suitable data.	**14**

OR

8.	a)	What is sedimentation? State & Explain factor Affecting sedimentation?	**7**
	b)	Design a plain sedimentation tank for population 2 lakhs with water supply Rate=130 lpcd, Detention time = 60 min and velocity = 50 cm/min and depth = 3.5 m.	**7**
9.	a)	What is disinfection? Explain in detail break point chlorination.	**6**
	b)	State various types of disinfectant used in water treatment.	**7**

OR

10.	a)	Chlorine usage in Treatment of 20,000 m^3/day is 7 kg/day the Residual chlorine after 10 min contact is 0.3 mg/lit. Calculate the dosages in milligram per liter and chlorine demand of water.	**6**
	b)	Explain the layout of various water Distribution system.	**7**
11.	a)	What is solid waste? give classification of solid waste with their source explain in brief.	**6**
	b)	Discuss the various methods of collection of solid waste.	**7**

OR

12.	a)	Explain in detail "Sanitary land fill".	**6**
	b)	Explain Transfer Station and also state the requirement of transportation vehicle.	**7**

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B.E. (Civil Engineering) Third Semester (C.B.S.)

Engineering Geology

P. Pages : 2 **NRT/KS/19/3295**

Time : Three Hours * 0 1 7 8 * Max. Marks : 80

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7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Diagrams and chemical equations should be given whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) What do you understand by plate tectonics? Describe different types of plate margins with suitable sketch. **7**

b) Give the geological time scale. Add a note on principles of stratigraphy used for correlation. **7**

OR

2. Describe the geological works done by River with respect to erosion, transportation & deposition along with their features. **14**

3. Explain the physical properties of minerals used for their identification. **13**

OR

4. What do understand by textures of igneous rocks? Give tabular classification of igneous rocks with its merits & demerits. **13**

5. a) At a proposed dam site shale bed is dipping at 1:4 along N60ºW and 1:5 along S60ºW. Find amount and direction of its tree dip.
scale 1 unit = 2.5 cm. **7**

b) In a level ground a limestone formation Is dipping at 30º East with its outcrop 160m wide. Find its real & vertical thickness scale 1cm = 40m. **7**

OR

6. What are faults? Describe various types of faults with neat sketches. Add a note on recognition of fault in a field. **14**

7. What is an earthquake? Discuss intensity & magnitude of earthquake. Add a note on location of epicenter of earthquake. **13**

OR

8. Describe the geological condition which influence the stability of Dam Structure. **13**

9. a) What do you understand by groundwater recharging? Describe various methods of groundwater recharging. **7**

b) Explain the vertical zones of subsurface ground water with neat sketch. **6**

OR

10. Explain seismic geophysical method of site investigation in detail. **13**

11. Write note on the following. **13**

a) Internal structure of the earth.

b) Prevention of Landslides.

c) Engineering properties of rocks (any four)

d) Electrical resistivity.

OR

12. Discuss the various geological problems met during the construction of a tunnel project. **13**

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B.E. (Civil Engineering) Third Semester (C.B.S.)

Concrete Technology

P. Pages : 2 **NRT/KS/19/3296**

Time : Three Hours * 0 1 7 9 * Max. Marks : 80

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7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) List important physical tests of cement ? Explain any two in brief. **8**

b) Explain in brief "Sulphate Resisting Portland Cement". **6**

OR

2. a) Explain field test on cement ? Also explain soundness test on cement. **7**

b) Explain the test on specific gravity, Bulk density & moisture content of aggregate. **7**

3. a) Explain various factors affecting workability of concrete. **7**

b) Explain under water concreting by the use of Tremie pipe method. **6**

OR

4. a) Write a short note on hot weather concreting and underwater concreting. **7**

b) Explain significance of water cement ratio. What is segregation and bleeding in concrete. **6**

5. a) Explain the various properties which affect the quality of concrete. **5**

b) Explain Modulus of elasticity of concrete. **4**

c) Explain Poison's ratio of concrete. **4**

OR

6. a) Explain the following :

i) Effect of height / diameter ratio on strength. **4**

ii) Compression Test **4**

b) Write the procedure & advantages of indirect Tension Test Methods. **5**

7. a) Explain concrete mix design procedure as per IS : 10262:2009. **7**

b) What are the significance of fly-ash & pozollonas in view of quality of concrete ? **6**

OR

8. a) Explain concrete mix design by Road Note No. 4 (BS) **7**

b) Write a short note on Air entraining admixtures plasticizers and super-plasticizers. **6**

9. a) What is high performance concrete. Also explain its procedure. Why this concrete is used in the field. **7**

b) Write short notes on : **6**

i) Self compacting concrete.

ii) High performance concrete.

OR

10. Explain :

i) Differential Shrinkage. **4**

ii) Relation between creep & time. **5**

iii) Shortcrete pumped concrete. **4**

11. a) Explain water as an agent of deterioration of concrete. **6**

b) What are types of cracks in concrete ? Explain various causes of cracks in concrete. **8**

OR

12. Explain in brief the following Non-Destructive testing of concrete. **14**

i) Rebound Hammer method.

ii) Ultrasonic pulse velocity testing method.

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