B.E. (Civil Engineering) Third Semester (CBS)

Applied Mathematics – III

P. Pages : 3 **AHK/KW/19/2056**

Time : Three Hours * 1 5 6 9 * 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.
6. Solve Question 9 OR Questions No. 10.
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. Sketch the function **7**

$$f(x)=\begin{cases}\pi+x; & -\pi<x\le 0\\ \pi-x; & 0\le x\le\pi\end{cases}$$

and hence find Fourier Series for $f(x)$.

Hence show that

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

OR

2. Obtain half range cosine series for $f(x)=2x-1;\ 0<x<1.$ **7**

3. a) Solve : $xq=yp+xe^{(x^2+y^2)}$ **6**

b) Solve : $(D^2+DD'-6D'^2)z=y\cos x$ **6**

c) Solve by method of separation of variables – **6**

$$3\frac{\partial u}{\partial x}-2\frac{\partial u}{\partial y}=0,\ u(x,0)=4e^{-x}$$

OR

4. a) Solve $(y+z)p-(x+z)q=x-y$ **5**

b) Solve $(D^2-3DD'+2D'^2)z=e^{2x+3y}+\sin(x-2y)$ **6**

c) A tightly stretched string with fixed end points $x=0,\ x=\ell$ is initially at rest in its equilibrium position. If it is set vibrating by giving each point a velocity $\lambda x(\ell-x)$, find the displacement of the string at any distance from one end at any time t. **7**

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

$$\int_{x_0}^{x_1} \left\{ x^2 (y')^2 + 2y^2 + 2xy \right\} dx$$

OR

6. Find the plane closed curve of fixed perimeter and maximum area. **7**

7. a) Investigate the linear dependence of vectors or not. Also find their linear combination if possible. $x_1 = (2, -1, 3, 2)$, $x_2 = (1, 3, 4, 2)$ and $x_3 = (3, -5, 2, 2)$. **6**

b) Find the modal matrix B corresponding to **6**
matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$ and verify that $B^{-1}AB$ is diagonal form.

c) Using Sylvester's theorem, prove that $\sin^2 A + \cos^2 A = I$, **6**
where $A = \begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$.

OR

8. a) Find the characteristic equation of the matrix **6**
$A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence find the matrix represented by
$A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$.

b) Solve $\frac{d^2y}{dt^2} - 4\frac{dy}{dt} + 3y = 0$, given $y(0) = 2$, $y'(0) = 2$ by matrix method. **6**

c) Reduce the following quadratic forms to canonical form by orthogonal transformation, also write the matrix of transformation $5x^2 + 6y^2 + 7z^2 - 4xy + 4yz$. **6**

9. a) Find the Newton – Raphson method, the root of the equation $e^x - 4x = 0$ nearer to 2, correct to three decimal places. **6**

b) Apply Gauss – Seidal method to solve the equations **6**
$4x + 11y - z = 33,\ 6x + 3y + 12z = 36,\ 8x - 3y + 2z = 20$

c) Using Euler's modified method, solve the equation **6**
$\frac{dy}{dx} = x + \left|\sqrt{y}\right|$; given $y = 1$, when $x = 0$ for range $0 \le x \le 0.4$ taking $h = 0.2$

OR

10. a) Find the root of the equation $x \log_{10} x - 1.2 = 0$ by method of false position correct to four decimal places. **6**

b) Use Crout's method to solve the equations – **6**
$5x + 2y + z = 12,\ x + 4y + 2z = 15,\ x + 2y + 5z = 20$.

c) Use Runge – Kutta method to find approximate value of y for $x = 0.2$ when **6**
$\frac{dy}{dx} = xy + y^2$, given $y(0) = 1$ taking $h = 0.1$.

11. The standard weight of a special purpose brick is 5 kg and it contains two basic ingredients B_1 and B_2. B_1 cost Rs. 5 per kg and B_2 cost Rs. 8 per kg. Strength considerations dictate that the brick contains not more than 4 kg of B_1 and minimum of 2 kg of B_2. Since the demand for the product is likely to be related to the price of the bricks, find out Graphically the minimum cost of the brick satisfying the above condition. **12**

OR

12. Solve the following LPP **12**

Maximize $Z = 30x + 16y + 25z$

Subject to the constraints

$8x + 4y + 5z \leq 1000$

$5x + 3y + 3z \leq 650$

$9x + 6y + 9z \leq 1260$

$x, y, z \geq 0$

****

B.E. (Civil Engineering) Third Semester (CBS)

Strength of Materials

P. Pages : 3 **AHK/KW/19/2057**

Time : Three Hours * 1 5 7 0 * 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.
6. Solve Question 9 OR Questions No. 10.
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. Use of non programmable calculator is permitted.

1. a) Draw stress strain curve for mild steel under tension & explain the salient point. **5**

b) A composite section made up of copper rod 200 mm diameter enclosed in steel tube of 150 mm internal diameter & 12 mm thick. Length of assembly is 600 mm and fastened at both ends. If temperature of rod is raised to 60ºC find the stresses developed in each material. Take $E_c = 1.05\times10^5 N/mm^2, E_s = 2\times10^5 N/mm^2$, $\alpha_s = 12\times10^{-6}/^oC$ and $\alpha_c = 17.5\times10^{-6}/^oC$. **8**

OR

2. a) A bar 12 mm in diameter is tested on UTM and following observations are noted. **5**
1) Gauge length = 200 mm.
2) Load at proportional limit = 20 kN.
3) Change in length at proportional limit = 0.2 mm.
4) Change in diameter at proportional limit = 0.0025 mm.

Calculate the value of modulus of elasticity and Poisson's ratio.

b) A 1.5 m long steel bar is having uniform diameter of 40 mm for a length of 1 m in the next 0.5 m its diameter gradually reduces from 40 mm to 20 mm as shown in fig. 1. Determine the elongation of the bar when subjected to an axial tensile load of 160 kN. **8**

Given $E = 200\times10^3 N/mm^2$.

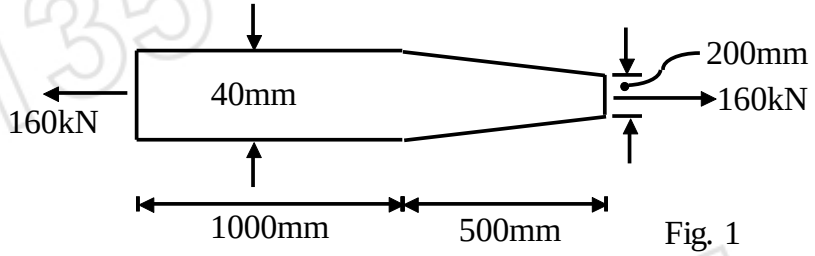

Fig. 1

3. Shear force diagram in fig. 2 & for a beam which rests on two supports one being on the left hand end. Deduce directly from the shear force diagram. **14**

i) The bending moment at 2 m interval along the beam.

ii) The loading on the beam.

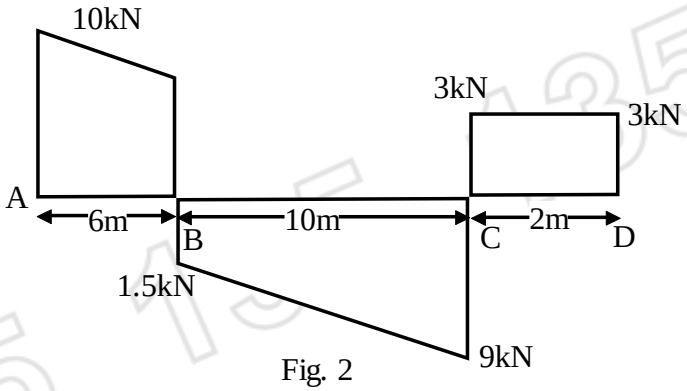

Fig. 2

OR

4. Draw SFD & BMD for the loaded beam shown in fig. 3 and also find the point of contraflexure, if any. **14**

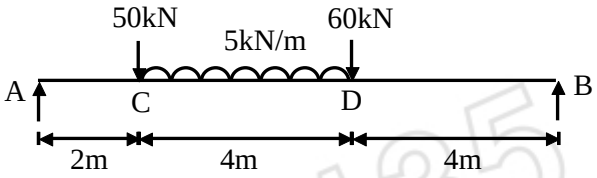

Fig. 3

5. A simply supported beam carries a UDL of 35 kN/m over a span of 20 m. The cross section of beam is a T section having dimensions as shown in fig. 4. Calculate the maximum shear stress for the section of the beam. **13**

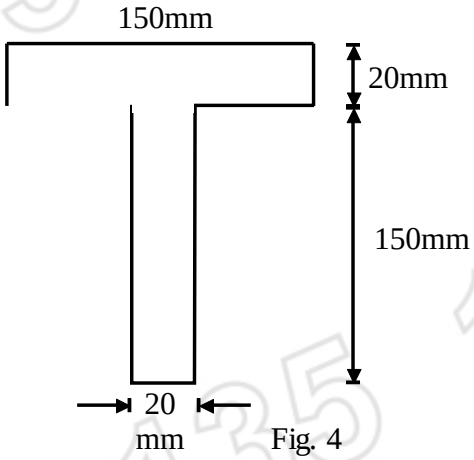

Fig. 4

OR

6. Derive the suitable assumption flexure formula for beam. **13**

7. A solid circular shaft is to transmit 350 kN at 150 rpm. If the shear stress is not on exceed $80\,N/mm^2$. Find the diameter of the shaft. What % of saving in weight would be obtained if this shaft is replaced with hollow one whose internal diameter is 0.6 times of external diameter? The length, material & maximum shear stress being same. **13**

OR

8. Compare the weight of solid shaft with that of a hollow one having the same length of transmit a given power at a given speed, if the material used for both the shaft is the same. Take the inside diameter of the hollow shaft as 0.6 times outer diameter. **13**

9. Determine the deflection under the loads in the beam shown in fig. 5. **13**

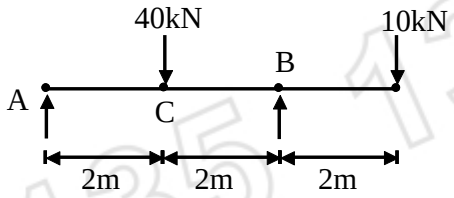

Fig. 5

OR

10. a) Find deflection of simply supported beam carrying a point load at centre. **8**

b) Derive differential equation of flexural beam. **5**

11. At point in a strained material there are two mutually perpendicular stress of $60\,N/mm^2(T)$ and $50\,N/mm^2(C)$. They are accompanied by shear stress of $100\,N/mm^2$. **14**

i) Normal and tangential stresses on the inclined plane making 30º clockwise with X axis.
ii) Principal stresses & principal planes location.
iii) Maximum shear stress & its location.

OR

12. A circle of 400 mm diameter is scribed on a mild steel plate before it is subjected to stresses as shown in fig. 6. Calculate the lengths of major and minor axis of the ellipse and also find their direction. $E = 2\times10^5\,N/mm^2$, $\mu = 0.3$. **14**

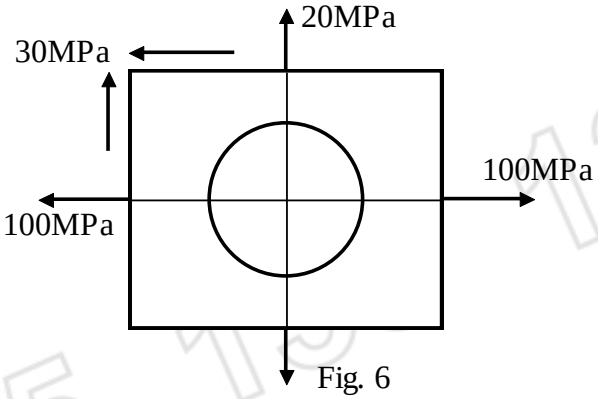

Fig. 6

****

B.E. (Civil Engineering) Third Semester (CBS)

Environmental Engineering-I

P. Pages : 2 **AHK/KW/19/2058**

Time : Three Hours * 1 5 7 1 * 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.
6. Solve Question 9 OR Questions No. 10.
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. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. a) Explain the types of water demand. **6**

b) The town population data is given for the period from year 1980 to 2010. Estimate population for the year 2030 by incremental increase method. **7**

Year	1980	1990	2000	2010
Population	50,000	65,000	82,000	1,20,000

OR

2. a) Describe with neat sketch the River Intake. **6**

b) What are the different sources of water? Explain any two in details. **7**

3. a) Explain scour valve & flange joint in details. **7**

b) Water is to be supplied to a town having population of 1.5 lacs. If the water work is situated at a lower elevation of 40 m. Determine the size of gravity main to convey the water from source to water work. The length of the gravity main is 20 km. LPCD is 180 and the pump works for the period of 12 hrs. a day. Take f = 0.03. **7**

OR

4. a) A water supply scheme is to be designed for a city of population 5 lacs. Calculate the size of conveyance main if the storage reservoir is 10 km away from city. Loss of head is 15 m. Assume water demand as 135 LPCD. Pump works 12 hr in a day and f = 0.04. **7**

b) Explain Rising main with neat sketch. **7**

5. a) Draw a flow diagram of water treatment plant. Explain it's function. **7**

b) Design a cascade aerator for 9 MLD. Velocity is 1.3 mls assume suitable data. **6**

OR

6. a) Explain in details the physical & chemical characteristics of water. **7**

b) Describe water borne diseases in detail. **6**

7. a) Briefly explain common coagulants used in water treatment plant. **7**

b) Explain with neat sketch, the working of clariflocculator. **7**

OR

8. a) A town having population of 1.6 lacs, per capita demand being 180 lpcd. Determine the size of Rapid sand filter by assuming rate of filtration is 4000 lit/hr/m^2. **7**

b) Write down the difference between Rapid sand and Slow sand filter. **7**

9. a) What are the requirements of good disinfectant and explain break point chlorination. **7**

b) Explain the mass curve method in detail. **6**

OR

10. a) Explain the elevated and ground service reservoir with neat sketch. **7**

b) Explain in details Dead End & Grid Iron System. **6**

11. a) What are the methods of municipal solid waste collection. Explain in details. **7**

b) Explain the sanitary Land fill system. **6**

OR

12. a) Write a short note on Bangalore method of composting. **7**

b) Discuss the composition and sources of solid waste. **6**

****

B.E. (Civil Engineering) Third Semester (CBS)

Engineering Geology

P. Pages : 2 **AHK/KW/19/2059**

Time : Three Hours * 1 5 7 2 * 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.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Give a brief account of the internal structure of the earth based on the earthquake data analysis. **7**

b) Explain the plate tectonic theory along with different types of plate margins. **6**

OR

2. Describe the geological work done by wind alongwith their erosional and depositional features. **13**

3. What is a mineral? Describe various physical properties of mineral with suitable examples. **13**

OR

4. What are Igneous rocks? Discuss the origin of Igneous rock alongwith its tabular classification. **13**

5. a) In a landslide prone area, a soft shale bed is striking N40ºW with an apparent dip of 1 in 5.5 along S20ºW. Find the amount and direction of its true dip. Give procedure. **7**
Scale :- 1 unit = 1 cm.

b) A marble bed is dipping at 45º in a slope of 15º west with its outcrop 200 m wide. Find the true and vertical thickness of marble bed. **7**
Scale : 1 cm = 40 m.

OR

6. What are Faults? Describe various types of faults. Add a note on their importance in civil engineering projects. **14**

7. What are earthquakes? Discuss various causes of the earthquake. Write a note on the method of location of epicenter on a map. **13**

OR

8.		What is landslide? Discuss various causes of landslide and their preventive measures.	**13**
9.	a)	Illustrate the hydrological cycle. Describe various zones of groundwater.	**7**
	b)	Write notes on confined, unconfined and perched aquifers.	**6**

OR

10.		Enumerate various geophysical methods of geological investigation. Describe in detail about the Electrical Resistivity method of geophysical investigation at civil engineering construction sites.	**13**
11.	a)	What is RQD? Describe the RQD in detail with a suitable example.	**7**
	b)	What are the characteristics of good building stones and railway ballasts.	**7**

OR

12.		Discuss the geological conditions of layered rocks at the foundation sites that influence the stability of a dam structure.	**14**

****

B.E. (Civil Engineering) Third Semester (CBS)

Concrete Technology

P. Pages : 2 **AHK/KW/19/2060**

Time : Three Hours * 1 5 7 3 * 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.
6. Solve Question 9 OR Questions No. 10.
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.
11. Use of non programmable calculator is permitted.

1. a) What are Bogue's compounds? Explain the significance of each on the properties of cement. **7**

b) Enlist various physical properties of coarse aggregate and discuss effect of each on strength of concrete. **7**

OR

2. a) What is grading of aggregates? Describe the procedure to find the Fineness Modulus of the aggregates. **7**

b) What is Portland cement? Enlist various types of cement with their relative advantages and disadvantages. **7**

3. a) Define workability. Enlist the various test to measure the workability of concrete. Explain any one test on workability. **7**

b) Explain Abrahm's water cement Law in detail. **6**

OR

4. a) What are the various causes of bleeding and segregation in plastic concrete? **6**

b) Explain in brief various types of curing methods. **7**

5. a) Describe the various factors affecting the compressive strength of concrete. **7**

b) Write comparison between cube strength and cylinder strength. **6**

OR

6. Write short notes on-

a) Bond between concrete and Steel Reinforcement. **5**

b) Split Cylinder test. **4**

c) Accelerated curing test. **4**

7. a) Describe IS-10262 method on concrete mix design procedure. **7**

b) What are the drawbacks of using $Cacl_2$ as an accelerator. **7**

OR

8. a) Distinguish between Plasticizers and Superplasticizers. **7**

b) Calculate the quantity of water to be added per bag of cement in cement concrete of 1:1.5:3.0 ratio by volume with water cement ratio as 0.45 by weight. The aggregates available in the field are dry and the absorption capacity of fine aggregate and coarse aggregates is 1.0% and 2.0% by volume respectively. **7**

9. a) What aspects are to be investigated for high performance concrete in complex exposure conditions? **7**

b) What are the factors affecting creep? Discuss in detail. **6**

OR

10. a) What is ferrocement? What are it's applications? **7**

b) What is Shrinkage? How can it be controlled? **6**

11. a) What are the various causes of cracks in concrete. **7**

b) What are the causes of deterioration of concrete. **6**

OR

12. Write notes on-

a) Sulphate Attack. **5**

b) Non-Destructive Test. **4**

c) Repair of Cracks. **4**

****