10.6 FEB 2023

Reg. No.												

Question Paper Code	11681

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Third Semester

Civil Engineering

20CEPC301 - STRENGTH OF MATERIALS - I

(Regulations 2020)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

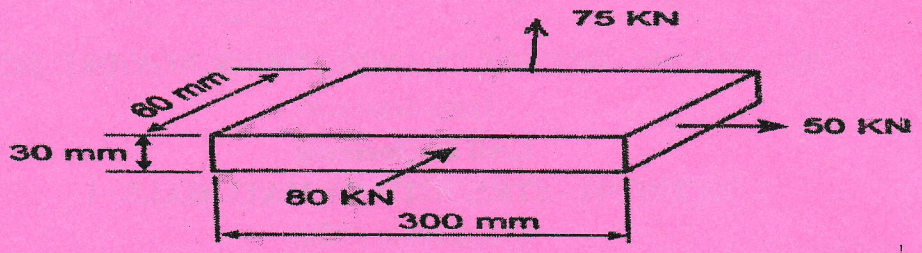
		Marks, K-Level,CO
1.	Define Stress and Strain. List the types of stress and strain.	2,K1,CO1
2.	Give the formula for modulus of elasticity and rigidity modulus.	2,K1,CO1
3.	Define principal stress and principal planes.	2,K1,CO2
4.	What is Volumetric strain? Give the formula for Volumetric strain of a cylindrical rod.	2,K1,CO2
5.	Define shear force and bending moment at a section.	2,K1,CO3
6.	Write the expression for simple bending equation.	2,K1,CO3
7.	What are the methods for finding out the slope and deflection at a section?	2,K1,CO4
8.	State two theorems in the moment area method.	2,K1,CO4
9.	Write the expression for the Torque transmitted by a solid shaft when subjected to Torsion.	2,K1,CO5
10.	Formulate the mathematical expression for deflection of an open coiled helical spring.	2,K1,CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Three bars made of copper, zinc and aluminium are of equal length and have cross section 555, 705 and 1020 mm^2 respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 255 kN, estimate the proportional of the load carried on each rod and the induced stresses. Take the value of E for copper = 1.3×10^5 N/mm^2 , for zinc = 1×10^5 N/mm^2 and for aluminium = 0.8×10^5 N/mm^2.	13,K2,CO1
		OR	
	b)	Derive the relationship between modulus of elasticity and modulus of rigidity.	13,K2,CO1

12. a) The steel plate 300 mm long , 60mm wide and 30 mm deep is acted upon by the forces shown in figure. Determine the change in volume. Take E = 200 kN/mm^2 and Poisson's ratio=0.3. *13,K3,CO2*



OR

b) The stress on two mutually perpendicular planes through a point on a body are 30 N/mm^2 and 20 N/mm^2 both tensile, along with a shear stress of 15 N/mm^2, find the normal and tangential stresses on a plane inclined at 40° to the axis of minor principal stress. *13,K3,CO2*

13. a) A simply supported beam of length 6m carries a point load of 3 kN and 6 kN at distances of 2 m and 4 m from the left end. Draw the shear force and bending moment diagrams for the beam. *13,K3,CO3*

OR

b) (i) A rectangular beam 300 mm deep is simply supported over the span of 4 m. Determine the uniformly distributed load per metre which the beam may carry, if the bending stress should not exceed 120 N/mm^2 . Take I = 8×10^4 mm^4. *7,K3,CO3*

(ii) A rectangular beam 100 mm wide and 150 mm deep is subjected to a shear force of 30 kN. Determine (a) average shear stress and (b) maximum shear stress. *6,K3,CO3*

14. a) A Cantilever of length 3 m is carrying a point load of 25 kN at the free end. If the moment of inertia of the beam = 10^8 mm^4 and value of E = 2.1x 10^5 N/mm^2 find (i) Slope at the free end and (ii) deflection at the free end. *13,K3,CO4*

OR

b) A beam AB of span 6 m is simply supported at its ends. The beam carries two concentrated loads of 48 kN and 40 kN at a distance of 1m and 3m respectively from the left support A. Given E = 2 x 10^5 N/mm^2 and I = 85 x 10^6 mm^4. Using Macaulay's method, determine deflection under each load. *13,K3,CO4*

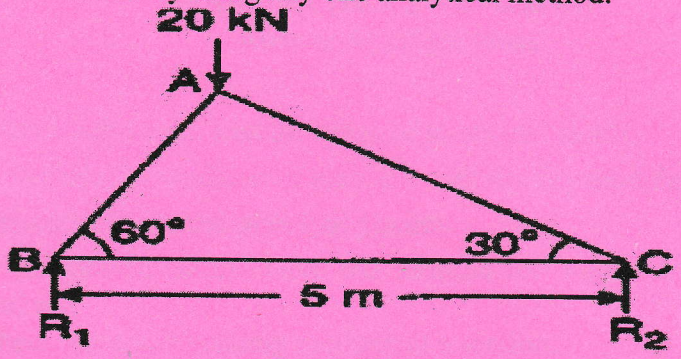
15. a) A hollow circular shaft is required to transmit 600 kW power at 110 r.p.m. The maximum torque is 20% more than the mean torque. Assume that the diameter ratio as 3/8 and Modulus of Rigidity G = 80 kN/mm^2. Determine the external and internal diameters of the shaft. *13,K3,CO5*

OR

b) A wagon weighing 2,000 kg and moving at 0.69 m/s has to be brought to rest by a buffer. Compute the number of springs that would be required in the buffer stop to absorb the energy of motion during a compression of 15 cm. Each spring has 15 coils, made of 2 cm wire, the mean diameter of the coils being 20 cm and $G = 0.8 \times 10^5$ N/mm^2. Also, determine the stiffness of spring. *13,K3,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) A truss loaded shown in fig. Analyze and find the reaction and forces in the members by using any one analytical method. *15,K3,CO6*



OR

b) The Fig. shows a Warren type cantilever truss along with the imposed loads. Determine the forces in all the members using the method of tension coefficients. *15,K3,CO6*