Reg. No.															

Question Paper Code	12851

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

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

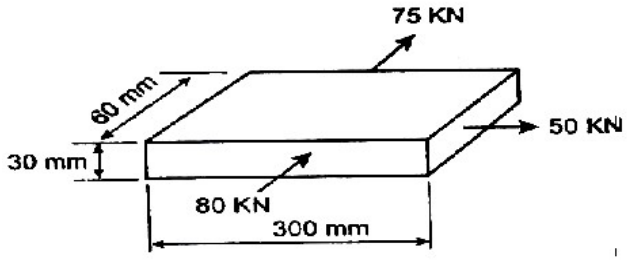
		Marks	K – Level	CO
1.	Define Stress and Strain.	2	K1	CO1
2.	Draw the stress strain curve for Mild steel.	2	K2	CO1
3.	Define principal stress and principal planes.	2	K1	CO2
4.	What is the use of Mohr's Circle?	2	K1	CO2
5.	Define shear force and bending moment at a section.	2	K1	CO3
6.	Define point of contraflexure. In which beams it will occur?	2	K2	CO3
7.	List the assumptions made in the theory of torsion.	2	K1	CO5
8.	Why hollow circular shafts are preferred than solid circular shafts?	2	K2	CO5
9.	Give relation between the number of members and joints in a truss and explain its uses.	2	K2	CO6
10.	Differentiate between plane truss and space truss.	2	K2	CO6

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

			Marks	K – Level	CO
11.	a)	Three bars made of copper; zinc and aluminium are of equal length and have cross section 555 mm^2, 705 mm^2 and 1020 mm^2 respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 255kN, 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)	A tensile test is conducted on a mild steel bar. The following data was obtained from the test: Diameter of the steel bar = 3cm, Gauge Length of the bar = 20cm, Load at Elastic limit= 250kN, Extension at a load of 150 kN = 0.21 mm, Maximum Load = 380kN, Total Extension = 60mm, Diameter of the rod at failure=2.25cm, Determine young's modulus, Stress at Elastic limit, Percentage of elongation & percentage decrease in area.	13	K2	CO1

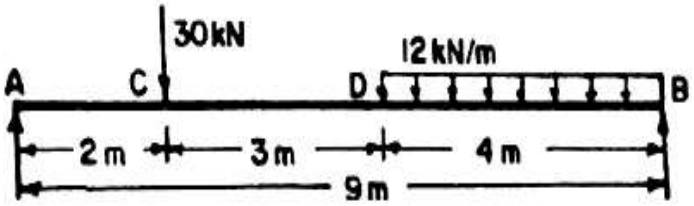
12. a) The steel plate 300mm long, 60mm wide and 30 mm deep is acted upon by the forces shown in figure. Determine the change in volume. Take E = 200 kN/mm^2 and Poisson's ratio=0.3. *13 K2 CO2*



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 15N/mm^2, find the normal and tangential stresses on a plane inclined at 40^o to the axis of minor principal stress by using Mohrs Circle method. *13 K2 CO2*

13. a) A simply supported beam of 9 m span is as shown in figure given below. Draw the B.M and S.F diagram indicating principal values. *13 K3 CO3*



OR

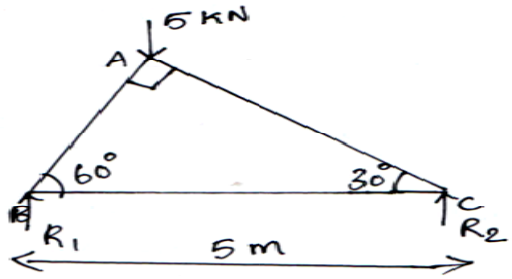
b) Calculate the maximum stress induced in a cast iron pipe of external diameter 40 mm, of internal diameter 20 mm and of length 4 m when the pipe is supported at its ends and carries a point load of 80 N at its centre. *13 K3 CO3*

14. a) A solid shaft is subjected to torque of 45 kNm. If the angle of twist is 0.5 degree per meter length of the shaft and the shear stress is not to be allowed to exceed 90 MN/m^2, find (i) suitable diameter for the shaft (ii) Final maximum shear stress, and (iii) Maximum shear strain in the shaft. Take C= 80 GN/m^2. *13 K2 CO5*

OR

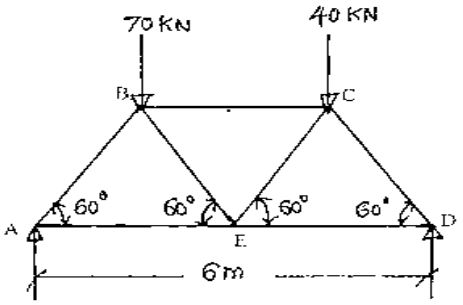
b) A closed coil helical spring is to carry a load of 100N. Its mean coil diameter is to be 8 times that of wire diameter. Calculate these diameters if the maximum stress in the material is 10 N/mm^2. Also find the stiffness of spring. Take G = 8.5 x 10^4 N/mm^2. *13 K2 CO5*

15. a) A truss with a span of 5m is carrying a load of 5kN as shown in the fig. Find the forces in all the members by using method of joints — *13 K2 CO6*



OR

b) Determine the forces in all the members of the truss shown in Fig using method of tension co-efficients — *13 K2 CO6*



PART - C (1 × 15 = 15 Marks)

16. a) Derive an expression for slope & deflection of a simply supported beam carrying UDL throughout its span by double integration method. — *15 K3 CO4*

OR

b) i) Derive the equation for maximum slope and deflection of a simply supported beam with central point load — *8 K3 CO4*

ii) Using double integration methods derive relation for slope at the supports and maximum deflection of a simply supported beam carrying UDL of intensity w / unit length throughout the span. — *7 K3 CO4*