Reg. No.												

Question Paper Code	12347

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

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 Poisson's ratio.	*2,K1,CO1*
2.	Write the relationship between young's modulus, rigidity modulus, and bulk modulus.	*2,K1,CO1*
3.	What is point of contra flexure?	*2,K1,CO3*
4.	Write the simple bending moment formula.	*2,K1,CO3*
5.	What are the methods available for finding out the slope and deflection at a section of a statically determinate beam?	*2,K1,CO4*
6.	Distinguish between actual beam and conjugate beam.	*2,K2,CO4*
7.	What are all the assumptions made in deriving the torsion equation for twisting of a shaft of solid circular section?	*2,K1,CO5*
8.	What is the equivalent stiffness of the two closed coil helical springs having stiffnesses of K_1 and K_2, if they are connected in series?	*2,K1,CO5*
9.	What is redundant truss?	*2,K1,CO6*
10.	What are the methods available for calculating the member forces of a truss?	*2,K1,CO6*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

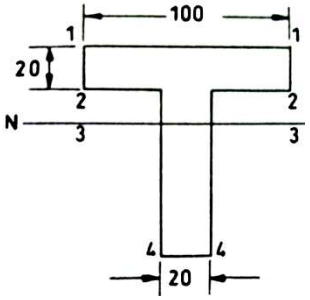
11. a) A tensile test was conducted on a mild steel bar. The following data was obtained from the test: *13,K2,CO1*
    a) Diameter of the steel bar = 40 mm
    b) Gauge length of the bar = 220 mm
    c) Load at elastic limit = 250 kN
    d) Extension at a load of 160 kN = 0.235 mm
    e) Maximum load = 390 kN
    f) Total extension = 70 mm
    g) Diameter of rod at failure = 23.5 mm

    Determine: (a) The Young's modulus (b) The stress at elastic limit
    (c) The percentage of elongation (d) The percentage decrease in area.

OR

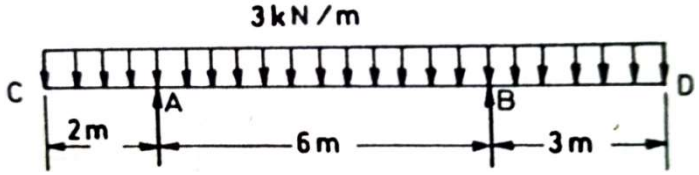
b) A Square rod is 100 cm long and size is 2 cm x 2 cm is subjected to an axial load of 30 kN. If the Modulus of Elasticity is 2 x 10^5 N/mm^2. Find the stress, strain and elongation in the rod. *13,K2,CO1*

12. a) A rolled steel joist of T section has the dimensions as shown in figure. This beam of T section carries a udl of 40 kN/m run on a span of 10 m, calculate the maximum stress produced due to bending. *13, K2,CO3*



OR

b) Draw the shear force and bending moment diagram for the two side overhanging beam as shown in Fig. *13, K2,CO3*



13. a) Derive an expression for slope & deflection of a simply supported beam carrying UDL throughout its span(l) by double integration method. *13,K3,CO4*

OR

b) Calculate the maximum slope and deflection at the free end of a cantilever beam subjected to a concentrated load at its free end using Moment Area method. *13, K2,CO4*

14. a) Determine the maximum torque that can be transmitted by a solid circular shaft of dia. 0.4 m, if permissible shear stress in the shaft is 50MN/m^2 and the angle of twist in a length equal to 15 times the dia. of the shaft is 1°. Modulus of rigidity G = 80 GN/m^2. *13, K2,CO5*

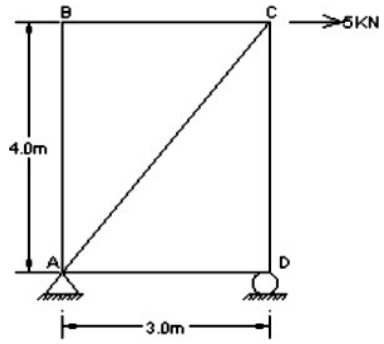
OR

b) A closed coil helical spring has a mean diameter of the coil 120 mm and rate of the spring is 20 kN/m. *13, K2,CO5*

(a) Find the required diameter if the number of coils is to be 15

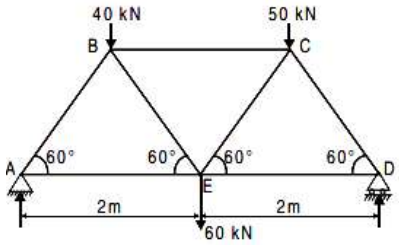
(b) Find the number coils if the wire diameter is 10 mm. Take G = 80 GN/m^2.

15. a) For the truss shown in Fig, find the member forces using Method of Tension Co-efficients. *13, K2,CO6*



OR

b) For the truss shown in Fig, find the member forces using method of joints. *13, K2,CO6*



PART - C (1 × 15 = 15 Marks)

16. a) A rectangular block of material is subjected to a tensile stress of 100 N/mm^2 on one plane and a tensile stress of 50 N/mm^2 at right angle, together with the shear stresses of 60 N/mm^2 on the same planes. Find *15,K2,CO2*
   a) The magnitude of the principal stresses,
   b) The direction of the principal planes and
   c) The magnitude of the greatest shear stress.

OR

b) A rectangular block of sides 100 mm x 25 mm x 50 mm is subjected to normal forces on its faces as shown in Fig. Determine the change in the volume of the block. Take E = 210 kN/m^2. μ = 0.3. The forces may be assumed to be uniformly distributed on the faces. *15, K2,CO2*