Reg. No. : | | | | | | | | | | |

Question Paper Code: 53013

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Third Semester

Civil Engineering

15UCE303 - MECHANICS OF SOLIDS - I

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The Poisson's ratio cannot have the value

   (a) 0.7 (b) 0.2 (c) 0.1 (d) 0.5

2. The Mohr's circle is used to determine the compound stresses

   (a) Graphically (b) Analytically (c) Physically (d) None of these

3. In method of joints the number of static equilibrium equation available is

   (a) 3 (b) 2 (c) 1 (d) 0

4. The shape of bending moment diagram over a length of a beam, carrying a uniform uniformly distributed load is always

   (a) linear (b) parabolic (c) cubical (d) circular

5. Torsional rigidity of a shaft is given by

   (a) T/J (b) T/r (c) T/θ (d) T/G

PART - B (5 x 3 = 15 Marks)

6. State the importance of Hooke's law.

7. Define the term 'principal stresses'.

8. What is perfect frame?

9. What is point of contraflexure?

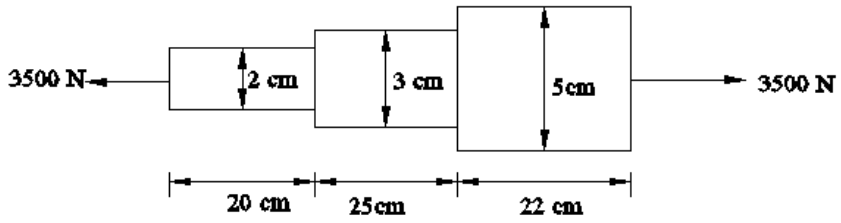
10. List the functions of spring.

PART - C (5 x 16 = 80 Marks)

11. (a) The following observations were made during a tensile test on a mild steel specimen 40 mm in diameter & 200 mm long elongation with 40kN load (with in limit of proportionality) $\delta L = 0.0304$ mm, yield load = 161 kn, maxi. Load = 242 kN, length of specimen at fracture = 249 mm. Determine (i) young's modulus of elasticity (ii) yield stress (iii) ultimate stress (iv) percentage of elongation. (16)

Or

(b) An axial pull of 3500 N is acting on a bar consisting of three length as shown in figure. If the young's modulus is $E = 2.1 \times 10^5$ N/mm^2. Determine (i) stresses in each section (ii) total extension of the bar. (16)

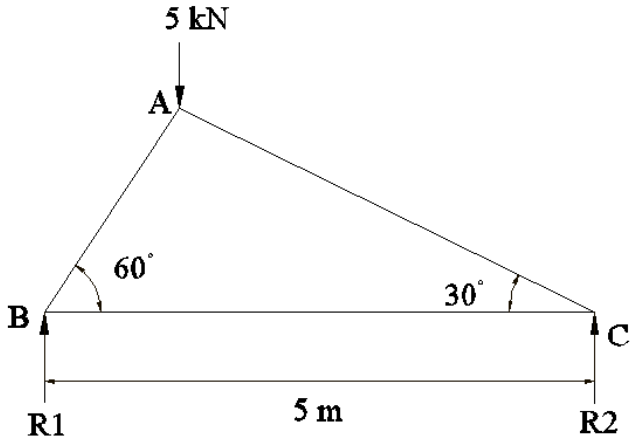


12. (a) A point is subjected to perpendicular stresses of 50 MN/m^2 and 30 MN/m^2, both tensile. Calculate the normal, tangential stresses and resultant stress and its obliquity on a plane making an angle of 30° with the axis of second stress. (16)

Or

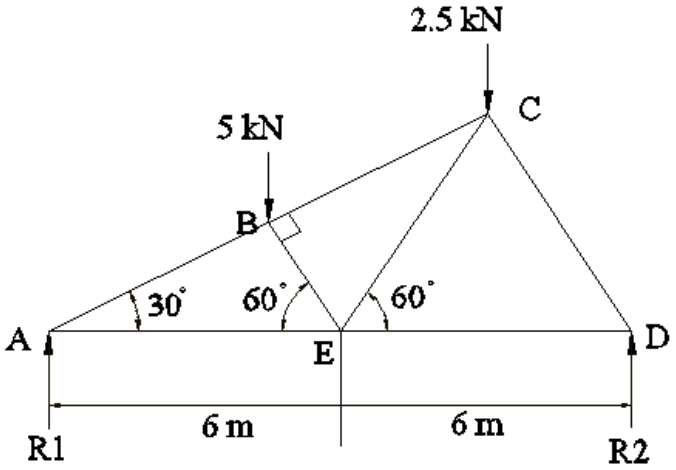
(b) A thin cylindrical tube 80 mm internal diameter and 5 mm thick, is closed at the ends and is subjected to an internal pressure of 6 MN/m^2. A torque of 2009.6 Nm is also applied to the tube. Find the hoop stress, longitudinal stress, maximum and minimum principal stresses and maximum shear stress. (16)

13. (a) A truss with a span of 5 m as shown in figure and carrying a load of 5 kN at its apex. Find the forces in all the directions by using method of joints. (16)



Or

(b) A truss of 12 m span is loaded as shown in figure. Find the forces in the members of the truss by method of sections. (16)



14. (a) A cantilever of length 2 m carries a uniformly distributed load of 1 kN/m run over a length of 1.5m from the free end. Draw the shear force and bending moment diagrams for the cantilever. (16)

Or

(b) An I section beam 340 mm x 200 mm has a web thickness of 10 mm and flange of thickness of 20 mm. it carries a shearing force of 100 kN. Sketch the shear stress distribution across the section. (16)

15. (a) A solid circular shaft transmits 75 kW power at 200 r.p.m. Calculate the shaft diameter, if the twist in the shaft is not to exceed 1˚ in 2 metres length of shaft and shear stress is limited to 50 MN/m^2. Take C= 100 GN/m^2. (16)

Or

(b) A closed coiled helical spring has mean diameter of 75 mm and spring constant of 80 kN/m. it has 8 coils. What is the suitable diameter of the spring wire if maximum shear stress is not to exceed 250 MN/m^2. Modulus of rigidity of the spring wire material is 80 GN/m^2. What is the maximum axial load the spring can carry. (16)

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