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**Question Paper Code: 53104**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

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)

- Which law is also called as the elasticity law? CO1-U  
(a) Bernoulli's law      (b) Stress law      (c) Hooke's law      (d) Poisson's law
- Principal planes are those planes on which CO2-U  
(a) Normal stress is maximum      (b) Normal stress is minimum  
(c) Normal stress is either maximum or minimum      (d) Shear stress is maximum
- Trusses are subjected to \_\_\_\_\_ stress. CO3-R  
(a) Compressive      (b) Tensile      (c) Lateral      (d) Direct
- Sagging, bending moment occurs at the \_\_\_\_\_ of the beam. CO4-U  
(a) Support      (b) Mid span  
(c) Point of contra flexure      (d) Point of emergence
- When a close-coiled helical spring is subjected to an axial load, it is said to be CO5-R  
under R  
(a) Bending      (b) Torsion      (c) Shear      (d) Crushing

PART – B (5 x 3= 15 Marks)

- Define factor of safety. CO1-R
- Differentiate between principal stresses and principal planes. CO2-U

8. Compare and contrast deficient and redundant frame. CO3-R
9. Mention any four assumptions in the theory of simple bending. CO4-U
10. Write the equation for strain energy stored in a shaft due to torsion. CO5-R

PART – C (5 x 16= 80 Marks)

11. (a) A bar of 25mm diameter is subjected to a pull of 40kN. The measured extension on gauge length of 200mm is 0.085mm and the change in diameter is 0.003mm. Calculate the value of Poisson's ratio and the three moduli. CO1-App (16)

Or

- (b) Determine the change in length of compound bar ABCD as shown in Fig:1 if AB=2000 mm and diameter 75 mm, BC=2500 mm and diameter 100 mm and CD=3000 mm and diameter 60 mm Take  $E=200 \text{ kN/mm}^2$ . CO1-App (16)

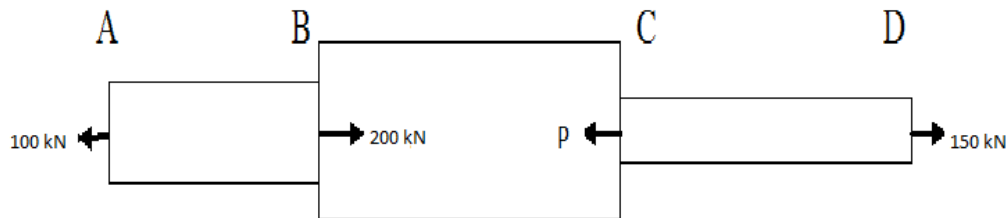


Fig.1

12. (a) The principal stresses in the wall of a container are  $40 \text{ MN/m}^2$  and  $80 \text{ MN/m}^2$ . Determine the normal, shear and resultant stresses in magnitude and direction in a plane, the normal of which makes an angle of  $30^\circ$  with the direction of maximum principal stress. CO2-App (16)

Or

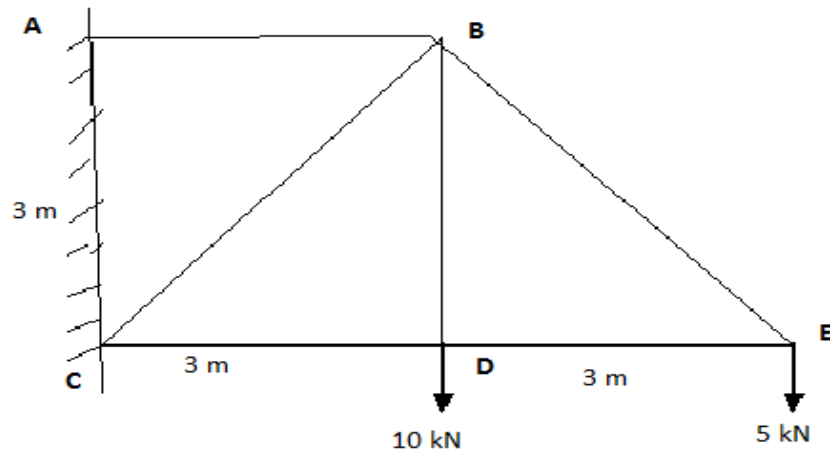
- (b) A point is subjected to a tensile stress of  $60 \text{ N/mm}^2$  and a compressive stress of  $40 \text{ N/mm}^2$ , acting on two mutually perpendicular planes. A shear stress of  $10 \text{ N/mm}^2$  is also acting on these planes. Determine the principal stresses and maximum shear stress. CO2-App (16)

13. (a) Summarize the various analytical methods to find out the forces in member of perfect frame. Give the advantage of method of section over method of joints. CO3-App (16)

Or

(b) Determine forces in members.

CO3-App (16)



14. (a) A cantilever beam of 3 m long carries a uniformly distributed load of 12 kN/m is spread over full length of beam. It also carries a point load of 15 kN at free end and another point load of 8 kN at 1 m from the fixed end. Draw shear force and bending moment diagrams for the beam. CO4-App (16)

Or

- (b) A simply supported beam AB of span 4 m is subjected to two point loads of 2 kN and 4 kN each at C and D distance of 1.5 m and 3 m from the left end. Calculate the shear force and bending moment values at salient points. CO4-App (16)
15. (a) The hollow shaft, the internal diameter of which is 0.7 times the external diameter, is to transmit 380 kW at 140 rpm. The shear stress is not to exceed  $70 \text{ N/mm}^2$ . Find the external and internal diameters assuming that the maximum torque is 1.25 times the mean. CO5-App (16)

Or

- (b) A closed coil helical spring is to carry a load of 100 N and the mean coil diameter is to be 8 times that of the wire diameter. Calculate these diameters, if the maximum stress is to be  $10 \text{ N/mm}^2$ . CO5-App (16)

