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

Question Paper Code : 77014

B.Arch. DEGREE EXAMINATION, APRIL/MAY 2015.

Second Semester

AR 6201 – MECHANICS OF STRUCTURES – I

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State: Lami's theorem.

2. How do you determine the resultant of a set of non-concurrent plane forces?

3. What is meant by null member in a truss? How do you identify it?

4. State the assumptions made in method of joints for determining the forces in the members of a plane truss.

5. Determine the radius of gyration of a rectangle of width 'b' and depth 'd' with respect to its centroidal axis parallel to the width.

6. What is polar moment of inertia of an area?

7. How do you determine the yield strength of high tensile steel?

8. How volumetric strain is related with linear strains?

9. What is meant by Poisson's ratio? Which material has higher value of Poisson's ratio?

10. Determine the value of bulk modulus for a material, if the modulus of elasticity of the material is 200 GPa and the shear modulus is 80 GPa.

PART B — (5 × 16 = 80 marks)

11. (a) Find the magnitude and position of the resultant of the system of forces as shown in Fig.Q.11 (a).

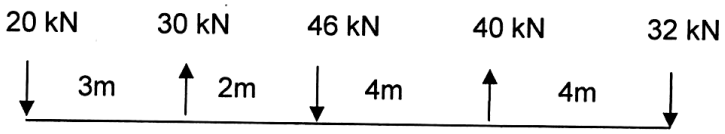
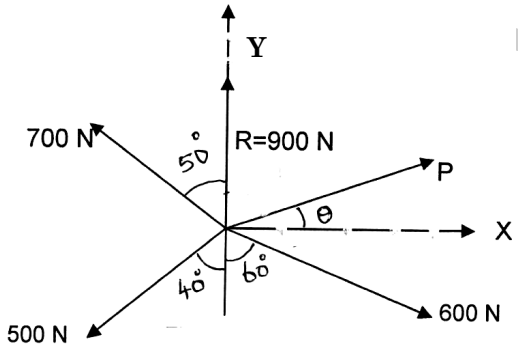


Fig.Q11(a)

Or

(b) The force system shown in Fig. Q 11 (b) has a resultant of 900 N pointing up along +ve Y axis. Find the value of P and θ required to give this resultant.



FigQ.11(b)

12. (a) Analyze the simply supported truss shown in Fig.Q.12(a) by method of joints.

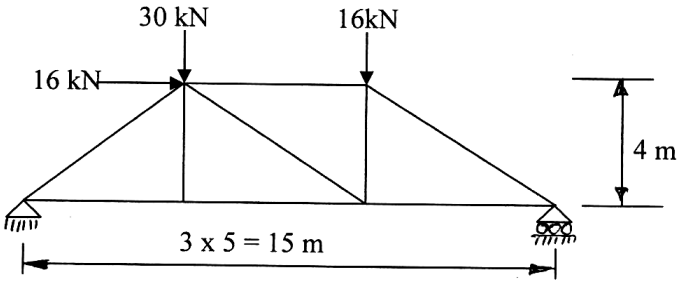


Fig.Q.12(a)

Or

(b) Analyze the cantilevered truss shown in Fig. Q.12(b) by method of joints.

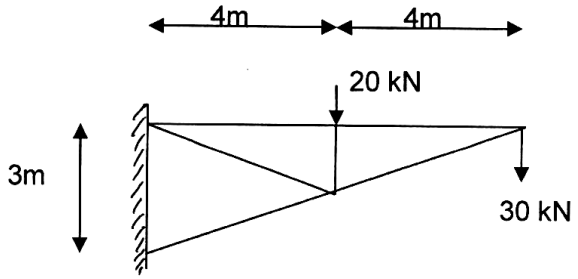


Fig.Q.12(b)

13. (a) Locate the centroid for the lamina shown in Fig. Q.13 (a)

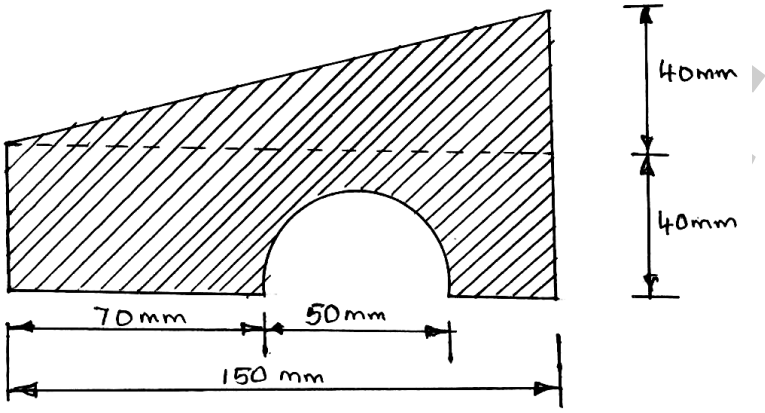


Fig.Q.13(a)

Or

(b) Determine the area moment of inertia (second moment of area) of an angle section 250 mm × 180 mm × 10 mm (with longer leg vertical) about its vertical and horizontal centroidal axes.

14. (a) A steel bar is 2.5 m in length and is subjected to an axial pull of 1200 kN. The bar is 30 mm in diameter for a length of 1.2 m, 25 mm in diameter for a length of 0.7 m and 20 mm in diameter for the remaining length. Find the total extension of the bar. Take modulus of Elasticity as 200 GPa.

Or

(b) A 500 mm long bar has rectangular cross section 50 mm × 60 mm. This bar is subjected to

(i) 50 kN tensile force on 50 mm × 60 mm faces

(ii) 150 kN compressive force on 50 mm x 500 mm faces, and

(iii) 250 kN tensile force on 60 mm x 500 mm faces

Find the change in volume of the bar. Take modulus of Elasticity as 2×10^5 N/mm^2 and Poisson's ratio as 0.30.

15. (a) An axial compressive load of 300 kN is applied to a metal bar of square section 50 mm × 50 mm. the contraction on a 200 mm gauge length is found to be 0.55 mm and the increase in thickness is 0.045 mm. Determine the modulus of Elasticity, shear modulus and Bulk modulus for the material.

Or

(b) (i) Derive the relationship between modulus of elasticity, shear modulus and Poisson's ratio. (8)

(ii) Derive the relationship between modulus of elasticity, bulk modulus and Poisson's ratio. (8)

———————