PSG POLYTECHNIC COLLEGE, COIMBATORE - 641 004

M12302 STRENGTH OF MATERIALS

Model Question Paper

Time : 3 Hours **Max.Marks: 100**

Instructions:

1. **Group A** and **Group B** questions should be answered in the Main Answer book.
2. Answer any **TEN** questions in **Group A**. Each question carries three marks.
3. Answer **ALL** questions either **(a)** subdivision or **(b)** subdivision in **Group B**. Each question carries 14 marks.

Group – A **Marks: 10 x 3 = 30**

1. State the Parallelogram Law for the addition of forces.
2. Define stress and strain with the units.
3. Write about resilience and proof resilience.
4. What is meant by thermal stresses?
5. Discuss Poisson's ratio.
6. Describe about composite bar.
7. Define thin cylinders. What are the stresses set up in a thin cylinder subjected to internal fluid pressure?
8. List the different types of failures of a riveted joint.
9. Discuss the disadvantages of welded joint over riveted joint.
10. What are all the different types of beams?
11. What is meant by point of contra-flexure?
12. What are the assumptions made in the theory of simple bending?
13. State torsional rigidity.
14. What is meant by "strength of a shaft"?
15. What is a spring? Name the two important types.

Group– B **Marks: 5 x 14 = 70**

16. a) (i) Two forces of magnitude 15 N and 12 N are acting at a point. The angle between the forces is 60^o. Find the resultant in magnitude. (7)

(ii) Three forces of magnitude 40 kN, 15 kN and 20 kN are acting at a point O. The angle made by 40 kN, 15 kN and 20 kN forces with x-axis are 60^o, 120^o and 240^o respectively. Determine the magnitude and direction of the resultant force. (7)

(OR)

b) (i) A tensile load of 40 kN is applied axially on a bar of diameter 5 cm. What is the tensile stress in the section? (7)

(ii) A Steel rod of diameter 500mm and length 2.5m is subjected to gradually applied load of 20 kN. Calculate the strain energy in the rod. Take E = 2x105 N/mm^2 (7)

17. a) A compound tube consists of a steel tube 170mm external diameter and 10mm thickness and an outer brass tube 190 mm external diameter and 10mm thickness. The two tubes are of same length. The compound tube carries an axial load of 1MN. Find the stress and the load carried by each tube and the amount by which it shortens. Length of each tube is 0.15 m.Take E_s = 200 GN/m^2 and E_b=100 GN/m^2

(OR)

b) A steel rod of 20mm diameter passes centrally through a copper tube of 50mm external diameter and 40 mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 50°, Calculate the stresses developed in copper and steel. Take E_s=200 kN/mm^2 and E_c=100 kN/mm^2 and α_s= 12x10^{-6} /°C and α_c=18x10^{-6}/°C

18. a) A boiler shell is to be made of 20mm thick plate having a limiting tensile stress of 125 N/mm^2. If the efficiencies of the longitudinal and circumferential joints are 80% and 30% respectively, determine (i) the maximum permissible diameter of the shell for an internal pressure of 2.5 N/mm^2 and (ii) Permissible intensity of internal pressure when the shell diameter is 1.6m.

(OR)

b) (i) Two plates 8m thick are joined by a single riveted lap joint. The diameter of the rivets is 16mm and pitch = 50mm. If σ_t = 120 N/mm^2, σ_s = 90 N/mm^2, σ_b = 160 N/mm^2, determine the efficiency of the riveted joint. (7)

(ii) A double riveted double cover butt joint is used to connect two plates 15mm thick. The rivets are 26mm in diameter and are provided at a pitch of 100mm. The allowable stresses in tension, shear and bearing are 130 N/mm^2, 75 N/mm^2 and 150 N/mm^2 respectively. Find the efficiency of the riveted joint. (7)

19. a) A beam of length 6m is simply supported at the ends and carries a uniformly distributed load of 1.5 kN/m run and three concentrated loads of 1 kN, 2kN and 3kN acting at a distance of 1.5m, 3 m and 4.5 m respectively from left end. Draw the SF and BM diagrams and determine the maximum bending moment.

(OR)

b) A timber beam is freely supported on supports 6m apart. It carries a U.D.L of 12kN/m run and a point load of 9kN at 3.5m from the right support. Design a suitable section of the beam making a depth twice the width, if the stress in timber is not to exceed 8N/mm^2.

20. a) Determine the diameter of a solid shaft which will transmit 337.5 kW at 300 rpm. The maximum shear should not exceed 35 N/mm2 and twist should not be more than 1° in a shaft length of 2.5 m. Take modulus of rigidity = 9X104 N/mm^2.

(OR)

b) A closely-coiled helical spring of round steel wire 8 mm in diameter having 10 complete turns with a mean diameter of 10 cm is subjected to an axial load of 250 N. Determine the: (í) the deflection of the spring, (íí) Maximum shear stress in the wire and (ííí) stiffness of the spring. Take C = 8×104 N/mm^2.

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