PSG POLYTECHNIC COLLEGE, COIMBATORE - 641 004

B12302 MECHANICS 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 two 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 Hooke's law.
2. Define factor of safety.
3. A steel rod of 10 mm diameter and 3 m long is subjected to an axial pull of 10 kN. Find the stress induced in the bar.
4. List the various types of beams.
5. Define bending moment.
6. A cantilever beam of length 4m is carrying a point load of 12kN at its free end. Calculate the shear force and bending moment at the fixed end of the beam.
7. List the various assumptions made in theory of simple bending.
8. Define section modulus.
9. What is meant by stiffness of beam?
10. Define torsional rigidity.
11. Write the torsion equation with the units of various terms.
12. A hollow circular shaft is having external diameter 75 mm and internal diameter 40 mm. If the maximum shear stress is not to exceed 80 N/mm^2, find the torque transmitted.
13. List the classification of gears.
14. Compare flat belt drive with v-belt drive.
15. What is meant by slip of belt?

Group– B **Marks: 5 x 14 = 70**

16. a) A steel rod 2m long and 200 mm diameter is subjected to an axial pull of 45 KN. Find the changes in i)length ii) diameter iii) volume of the rod, if E=0.2 X 106 N/mm2 and 1/m = 0.3.

(OR)

b) A bar of length 150mm is 50mm in diameter. It is subjected to an axial pull of 400KN. The extension in length and contraction in diameter were found to be 0.25 and 0.02mm respectively. Determine the values of elastic constants.

17. a) A cantilever 6m long carries three point loads 2KN, 2 KN and 3 KN at a distance 1.5m, 4m and 6m respectively from the fixed end. It also carries an u.d.l of 1.5KN/m run spread over 4m from free end. Construct the SFD and BMD.

(OR)

b) A beam 8m long is simply supported at its end. It carries an u.d.l of 1 KN/m over the length of the left half of its span together with concentrated loads of 2 KN, 3 KN and 2 KN situated at 2m, 4m and 6m respectively from left hand support. Draw SFD and BMD and find out the magnitude and position of maximum bending moment.

18. a) i) A rectangular cantilever beam of span 2m carries a point load of 600N at the free end. If the cross section of the beam is 100mm wide and 150mm deep, find the maximum bending stress induced. (7)

ii) A rectangular beam of 200mm and 100 mm wide is simply supported over a span of 8 m and carries a central point load of 25 KN. Determine the maximum stress in the beam. Also calculate the value of longitudinal fibre stress at a distance of 25mm from the top surface of the beam. (7)

(OR)

b) i) A simply supported beam of rectangular section carries central load of 25 KN over a span of 6m. The bending stress should not exceed 7.5N/mm2. The depth of the section is 400mm. Calculate the necessary width of the section. (7)

ii) A wooden beam of rectangular section 100 X 200 is simply supported over a span of 6m. Determine the u.d.l it may carry if the bending stress is not to exceed 7.5N/mm2. Estimate the concentrated load it may carry at the centre of beam with the same principle stress. (7)

19. a) Find the torque transmitted by i) solid shaft of diameter 0.4m ii) hollow shaft of external diameter 0.4m and internal diameter 0.2m if the angle of twist is not to exceed 1° in a length of 10m of both the shafts. Take G or N = 0.8 X 105 N/mm2.

(OR)

b) A hallow shaft having inner diameter 0.7 times the outer diameter is to replace a solid shaft of the same material to material to transmit 500KW at 200rpm. The permissible shear stress is 80 N/mm2. Calculate the diameter of solid and hollow shaft. Also calculate percentage saving in material.

20. a) i) Compare gear drive with belt drive. (5)

ii) Explain the nomenclature of a gear with simple sketch. (9)

(OR)

b) A belt 100 mm wide and 10 mm thick is transmitting power at 1000 m/min. The net driving tension is 1.8 times of the tension on the slack side. If the safe permissible stress in the belt section is 1.6 N/mm^2. Calculate the maximum power that can be transmitted. Assume mass of the belt as 1.08 kg/m length.

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