shearing stress of 120 N/mm^2. The solid length of the spring is 45 mm. Find:

a. The wire diameter
b. The mean coil radius, and
c. The number of coils.

Take modulus of rigidity of material of the spring = 0.4×10^5 N/mm^2.

END OF PAPER

2209T139

D.Voc
Mechanical Manufacturing
Subject: Strength of Materials
Subject Code: ME-508
Semester: Fifth
Session:- September 2022
Theory (External): 35 Marks
Time: 03 Hours

Instructions to the Students

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of objective type in nature. All questions are compulsory. Each question carries 1 mark.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 5 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything in the question paper.
6. Whenever necessary, the diagram drawn should be neat and properly labeled.

Roll No.

SECTION – A (OBJECTIVE TYPE QUESTIONS)
(10 × 1 = 10 Marks)

A. What is Poisson's ratio?

B. What is lateral strain?

C. Define Young's modulus.

D. What are thin cylinders?

E. What are bending stresses?

F. Write bending equation with the meaning of each used symbol?

G. Define slenderness ratio.

H. How will you calculate power transmuted by a shaft?

I. Define proof resilience.

J. Define modulus of rigidity.

SECTION – B (ESSAY TYPE QUESTIONS)
(5×5 = 25 Marks)

1. A steel wire 2 m long and 3 mm in diameter is extended by 0.75 mm when a weight W is suspended from the wire. If the same weight is suspended from a brass wire, 2.5 m long and 2 mm in diameter, it is elongated by 4.64 mm. Determine the modulus of elasticity of brass if that of steel be 2.0×10^5 N/mm^2.
2. A cylindrical shell 3 m long which is closed at the ends has an internal diameter of 1 m and a wall thickness of 15 mm. Calculate the hoop and longitudinal stresses induced and also change in the dimensions of the shell if it is subjected to an internal pressure of 1.5 MN/m^2.

3. Derive the bending equation by using suitable assumptions.
4. Derive the torsion equation by using suitable assumptions.
5. Two wooden planks 150 mm × 50 mm each are connected to form a T-section of a beam. If a moment of 3.4 kNm is applied around the horizontal neutral axis, inducing tension below the neutral axis, find the stresses at the extreme fibres of the cross-section. Also calculate the total tensile force on the cross-section.
6. A bar of length 4 m when used as simply supported beam and subjected to a uniformly distributed load of 30 kN/m over the whole span, deflects 15 mm at the centre. Determine the crippling load when it is used as a column with following end conditions:
   a. Both ends pin-joined
   b. One end fixed and other end hinged
   c. Both end fixed
7. Two shafts of the same material and same length are subjected to the same torque. If the first shaft is of a solid circular section and the second shaft is of a hollow circular section, whose internal diameter is 2/3 of the outside diameter and the maximum shear stress developed in each shaft is the same, compare the weights of the two shafts.
8. A close-coiled helical spring is to have a stiffness of 900 N/m in compression, with a maximum load of 45 N and a maximum