

Roll No.

Total No. of Pages : 2

BT-4/M09

9342

Strength of Material-II

Paper : ME-206 E

Time : Three Hours]

[Maximum Marks : 100

Note :- Attempt any **FIVE** questions, selecting at least **ONE** question from each unit.

UNIT-I

1. Define Strain Energy and derive expressions for Strain Energy stored in a body when load is applied (i) suddenly (ii) gradually (iii) with impact. 20
2. What is the significance of theories of Failure, discuss in detail the different theories of Failures and their graphical representations. 20

UNIT-II

3. (a) Define Unsymmetrical bending and shear centre. Derive expression of unsymmetrical bending stating its assumptions. 15
(b) Determine shear centre of channel section. 5
(10×15×1 cm×cm×cm).
4. A boiler drum consists of a cylindrical portion 2m long, 1m diameter and 25 mm thick, closed by hemispherical ends. In a hydraulic test to 10N/mm² how much additional water will be pumped in, after initial filling at atmospheric pressure ? Assume the circumferential strain at the junction of cylinder and hemisphere is the same for both. For the drum material $E = 207,000 \text{ N/m}^2$ $\nu = 0.3$ for water $K = 2100 \text{ N/mm}^2$.

20

UNIT-III

5. A tube 8 cm inside and 12 cm outside diameter is to be reinforced by shrinking on a second tube of 16 cm outside diameter. The compound tube is to withstand an internal pressure of 35 MPa and the shrinkage allowance is to be such that the final maximum stress in each tube is to be the same. Calculate this stress and show on a diagram the variation of hoop stress in the two tubes. What is the initial difference of diameters before shrinking on ? $E = 200 \text{ GPa}$. 20
6. A steel disc 25 cm outside diameter and 5 cm inside diameter is shrunk on a steel shaft so that the pressure between the shaft and the disc at stand-still is 45 MPa. Assuming that the change in dimensions of the shaft are negligible, find at which speed the disc will loosen from the shaft. Density = 7800 kg/m^3 and $\nu = 0.3$. 20

UNIT-IV

7. A ring made of 2.5 cm diameter steel bar carries a pull of 10 KN. Calculate the maximum tensile and compressive stresses in the material of the ring. The mean radius of the ring is 15 cm. 20
8. (a) Derive the expression of strain energy for Laminated Springs. 12
- (b) A laminated steel spring 1m long is to support central load of 5.8 KN. If the maximum deflection of spring is not to exceed 45 mm and maximum stress should not exceed 300 MN/m^2 , calculate :-
- (i) Thickness of leaves
 - (ii) Their number if each plate is to be 80 mm wide
- $E = 200 \text{ GN/m}^2$. 8