

Roll No.

SECTION – A

24476

**B. Tech. 7th Semester (ME)
Examination – May, 2019**

STRENGTH OF MATERIAL-II

Paper : ME-401-F

Time : Three Hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Section. Question No .1 is *compulsory*. All question carry equal marks.

1. Explain the following : 4 × 5 = 20
- (a) Castigliano's Theorem
 - (b) Ellipse of Inertia
 - (c) Radial and hoop stress
 - (d) Leaf spring and concentric spring

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P. T. O.

- 2. (a) A bar 2m long and 25 mm in diameter is subjected to a tensile load of 60 KN. Taking $E = 2 \times 10^5 \text{ N/mm}^2$, calculate the strain energy and modulus of resilience. 10
- (b) Derive an expression of strain energy stored in a body when load is applied : Gradually and Suddenly. 10
- 3. A steel specimen 2.5 cm² in cross section stretches 0.008 cm over a 8cm gauge length under an axial load of 40 kN. Calculate strain energy stored in the specimen at this point. If the load at the elastic limit for specimen is 70 KN. Calculate the elongation at elastic limit and proof resilience. 20

SECTION – B

- 4. A steel bar of rectangular section 8 cm × 10 cm is arranged as a cantilever projecting horizontally 70 cm beyond the support. The broad face of the bar makes 45° with horizontal. A load of 250 N is hung from the free end. Find out the neutral axis, the horizontal and vertical deflections of free end, maximum tensile stress, $E = 200 \text{ GPa}$. 20

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5. Derive an expression for hoop strain and longitudinal strain in thin walled cylindrical & spherical vessels to internal 20 pressure. 20

SECTION - C

6. A compound cylinder is made by shrinking a cylinder of external diameter 320 mm and internal diameter of 200 mm over another cylinder of external diameter 200 mm and internal diameter 150 mm. The radial pressure at the junction after shrinking is 12 N/mm². Find the final stresses set up across the section, when the compound cylinder is subjected to an internal fluid pressure of 90 N/mm². 20
7. A Disc with outer radius 20 cm and inner radius 3.5 cm is press fitted on to a shaft of radius 3.795 cm. Both member are steel with E= 210 GPa, $\nu=0.29$, and with densities 7800 Kg/m³. Find out, (a) the stress distribution in disc at 4500 r.p.m. (b) Speed for which the interference pressure goes to zero. 20

SECTION - D

8. A curved bar of rectangular section, initially unstressed is subjected to bending moment of 1200 N-m. Which loads to Straighten the bar. The section is 6 cm wide by 5cm deep in the plane of bending and the mean radius of Curvature is 15 cm. Find out the position of the neutral axis and the magnitudes of the greatest bending stress and draw a diagram to show approximately how the stress varies across the section. 20
9. Derive an expression for deflection in an open coiled helical spring subjected to both axial load and couple. Derive an expression for principle stress. 20

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