

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– IV (Old) EXAMINATION – WINTER 2019****Subject Code: 140605****Date: 16/12/2019****Subject Name: Advanced Strength Of Materials****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Derive the equation of strain energy due to suddenly applied load. Also find the resilience. **07**
- (b) A weight of 2 kN is dropped on to a collar at the lower end of vertical bar 3m long and 28 mm in diameter. Calculate the maximum height of drop if the maximum instantaneous stress is not to exceed 120 N/mm^2 . What is the corresponding instantaneous elongation? Take $E = 2 \times 10^5 \text{ N/mm}^2$. **07**
- Q.2** (a) Derive the equation of strain energy due to impact loading. **07**
- (b) A curved beam of rectangular cross section 20 mm X 40 mm is subjected to pure bending with couple of 400 N.m. The mean radius of curvature is 50 mm. Find the maximum and minimum stresses. Also find the position of the neutral axis. Sketch the bending stress variation across the section. **07**
- OR**
- (b) A thin spherical shell has 400 mm diameter and wall thickness t . The shell is subjected to an internal pressure of 5 Mpa. The yield strength of material is 265 Mpa and f.o.s. is 3. Determine thickness of the shell using distortion energy theory. **07**
- Q.3** (a) Derive the basic formula for the shear stress distribution across the section **07**
- (b) Draw Shear stress distribution diagram for typical 'T' section. Find the shear stress values at important points **07**
- OR**
- Q.3** (a) What is shear center? State its practical significance. **07**
- (b) Explain the shear strain energy theory with its application. **07**
- Q.4** (a) Explain the Lamé's theory of thick cylindrical shell. **07**
- (b) A timber beam 150 mm wide and 300 deep carries a U.D.L. of $w \text{ kN/m}$ over a span of 3m. If the safe stress longitudinally 20 N/mm^2 and transverse shear stress 3 N/mm^2 , calculate the maximum load that the beam can carry. **07**
- OR**
- Q.4** (a) Explain the maximum principal stress theory with its limitations and advantages. **07**
- (b) Determine the stresses on crane. **07**
- Q.5** (a) What is shear center? State its practical significance. **07**
- (b) Determine the rotational stresses in discs. **07**
- OR**
- Q.5** (a) Define strain energy and derive the expression for strain energy due to torsion. **07**
- (b) State and explain: i) Maxwell's reciprocal theorem ii) Castigliano's first theorem. **07**
