Seat No.: ________ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(OLD) – EXAMINATION – SUMMER 2019

Subject Code:140605 **Date:29/05/2019**

Subject Name: Advanced Strength Of Materials

Time:02:30 PM TO 05:00 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 expression of strain energy due to gradually applied load. **07**

(b) A curved beam, circular in cross-section is subjected to pure bending of 700Nm. The beam has 20mm diameter. The mean radius of curvature is 50mm. The radius of curvature decreases due to bending. Find the maximum bending compressive stress and maximum bending tensile stress. **07**

Q.2 **(a)** A weight of 10kN falls by 30mm on a collar rigidly attached to a vertical bar 5m long and 1000mm^2 in section. Find the instantaneous extension of the bar. Take E = 2×10^5 N/mm^2. **07**

(b) A simply supported beam having span 5m is subjected to a UDL of 20kN/m over whole span. The cross-section of beam is rectangular section. The dimension of cross-section is 300mm × 450mm. Draw shear stress distribution across the depth of cross-section marking the values at salient points. **07**

OR

(b) Plot shear stress distribution diagram for any three standard sections. **07**

Q.3 **(a)** Derive the expression $\tau = \dfrac{VA\bar{y}}{bI}$ for shear stress variation with usually notations. **07**

(b) A cantilever of 4m length carrying u.d.l. of 20kN/m. Find the deflection at free end by using Castigliano's theorem. Take EI = constant. **07**

OR

Q.3 **(a)** Stating assumptions derive Lame's equations to find out the stresses in a thick cylindrical shell. **07**

(b) A cast iron pipe of 40cm internal diameter and 10cm thickness carries water under a pressure of 80kg/cm^2. Determine the maximum and minimum intensities of hoop stress across the section. Also sketch the radial pressure distribution and hoop stress distribution across the section. **07**

Q.4 **(a)** Derive an expression for the bending moment in a circular ring which is subjected to a tensile load along the diameter. **07**

(b) A ring made of 20mm steel bar carries a pull of 20kN. Calculate the maximum tensile stress and maximum compressive stress in the material of the ring, if the mean radius of the ring is 180mm. **07**

OR

Q.4 **(a)** Explain given failure theories (i) Maximum Principal strain theory (ii) Maximum strain energy theory. **07**

(b) A member having square cross section is subjected to axial pull of 15kN and shear force of 5kN. Design the cross section of member based on (i) The maximum principal stress theory (ii) The maximum shear stress theory for a member elastic limit in axial tension is 250MPa, Poisson's Ratio = 0.3 and Factor of safety = 2.5. **07**

Q.5 **(a)** A steel flywheel rim of mean 4m is uniformly rotating so that the maximum hoop stress in the material is 8N/mm^2. Find the angular speed in r.p.m. Neglect the arm effect. **07**

(b) Derive the equation of shear stress, bending stress, deflection and angular rotation for open helical spring. **07**

OR

Q.5 **(a)** Using Castigliano's theorem, calculate the propped reaction for the beam as shown in Fig.1. Take EI as constant. **07**

(b) A laminated steel spring simply supported at ends with span of 0.8 m is centrally loaded with a load of 8kN. The central deflection under the above load is not to exceed 50mm and the maximum stress is to be 400N/mm^2, determine; (i) width of plate (ii) thickness of plate (iii) number of plates (iv) the radius to which plates should be bent so that the spring become straight under the given 8kN load. Assume width= 10 × thickness and E= 200GPa. **07**

****

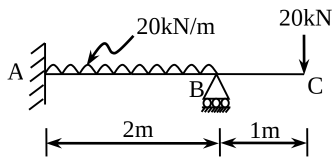

Fig.1

****