Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 140605 **Date: 26/05/2017**

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.**
4. **Whenever necessary, take Modulus of elasticity (E), Modulus of rigidity (C), Poisson's ratio (ν) and density (ρ) for steel as 200 GPa, 80 GPa, 0.3 and 7850 kg/m^3 respectively**

Q.1	**(a)**	Explain Strain Energy & Derive the formula for Strain Energy. Also derive the value of stress when the load is applied suddenly.	**07**
	(b)	Find the deflection at free end of a cantilever beam subjected to UDL of 50 kN/m for its full span of 2m. Use castiglianos theorem. Take EI = 75.6 kNmm^2	**07**
Q.2	**(a)**	Derive general expression for shear stress using usual notations and draw qualitative Shear Stress distribution diagrams for following sections: (a) Hollow Circular Section (b) Channel Section (c) Angle Section (d) Hollow Rectangular Section	**07**
	(b)	A mild steel plate having 400 mm length, 200 mm width and 50 mm thickness is subjected to a load of 1200 KN. Calculate Proof Resilience, Modulus of Resilience and Elongation if the load is applied (a) Gradually (b) Suddenly and (c) With impact height of 10 cm	**07**
		OR	
	(b)	Find the diameter of the steel shaft based on shear strain energy theory if it is subjected to maximum twisting moment of 22 kNm and maximum bending moment of 15 kNm. The design stress for tension is 160 MPa.	**07**
Q.3	**(a)**	Explain the following a. Maximum principal stress theory b. Maximum shear stress theory	**07**
	(b)	Find the diameter of shaft according to the maximum shear stress theory if the shaft is subjected to a maximum torque of 36 KNm and a bending moment of 18 KNm at a particular section. Take allowable equivalent stress in tension as 200 MPa.	**07**
		OR	
Q.3	**(a)**	Derive formulae for Strain Energy and maximum deflection for open coiled helical spring.	**07**
	(b)	An open coiled helical spring made from circular wire is required to carry a load of 2 kN. The wire diameter is 10 mm and the mean coil radius is 80 mm. If the helix angle of spring is 300 and number of turns are 12, calculate axial deflection and angular rotation of free end.	**07**
Q.4	**(a)**	A purlin section ISA 100 x 80 x 10 mm has to resist a shear force of 40 KN. Calculate shear stress at important locations and plot shear stress distribution diagram.	**07**

	(b)	An 8 meter long beam having symmetrical I – section with flanges of 300 mm X 20 mm and web 20 mm X 360 mm is carrying UDL of 30 KN/m for left half span with central point load of 50 KN. Draw shear stress distribution diagram for maximum shear force of the beam. Also calculate the ratio of maximum shear stress to average shear stress.	**07**
		OR	
Q.4	**(a)**	Stating the assumptions, derive the Lame's equation for the stresses in thick cylinder subjected to internal pressure.	**07**
Q.4	**(b)**	A cylinder having internal and external diameters as 420 mm and 220mm respectively is subjected to internal fluid pressure of 6.5 MPa. Find the maximum and minimum hoop stress in the cylinder material. Also sketch the radial stress distribution and circumferential stress distribution across the section.	**07**
Q.5	**(a)**	Derive Winkler Bach formula for bending of curved beams of large curvature.	**07**
	(b)	A crane hook curved to an internal diameter of 80 mm carries a load of 100 kN. The cross section of crane is symmetrical trapezium with top width 75 mm (concave side), bottom width 35 mm and depth 70 mm. Determine the maximum stresses in cross section.	**07**
		OR	
Q.5	**(a)**	Find an expression for the bending moment in a circular ring which is subjected to a tensile load along the diameter	**07**
	(b)	A flat steel disc having 1 m diameter and uniform thickness rotates at 3600 r.p.m. If the disc has a central hole 150 mm diameter. Determine the intensities of principal stresses.	**07**

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