

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- VII (New) EXAMINATION – WINTER 2019

Subject Code: 2171916

Date: 23/11/2019

Subject Name: Applied Mechanics of Solid

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.

		MARKS
Q.1	(a) Explain Stress Vector.	03
	(b) Define: 1) Body forces, 2) Surface forces	04
	(c) Enlist theory of failures and explain any two.	07
Q.2	(a) Explain Boundary conditions.	03
	(b) Explain Yield and Failure criteria.	04
	(c) Derive equation $n_x^2 + n_y^2 + n_z^2 = 1$ for Principal stresses.	07
	OR	
	(c) At a point P, the rectangular stress components are $\sigma_x = 1$, $\sigma_y = -2$, $\sigma_z = 4$, $\tau_{xy} = 2$, $\tau_{yz} = -3$, and $\tau_{xz} = 1$. All in units of kPa. Find the principal stresses and check for invariance.	07
Q.3	(a) What is Circular Polariscopes?	03
	(b) Define: Plane stress and plane strain.	04
	(c) With the help of neat sketch, discuss behavior of Prandtl-Reuss under plane stress $\sigma_{ij} = [\sigma_1, 0, \sigma_3]$.	07
	OR	
Q.3	(a) Elaborate Saint Venant's Principle.	03
	(b) State basic assumptions for the theory of incremental constitutive relation for elastic – plastic material.	04
	(c) Derive stress distribution using Airy's stress function in a simply supported beam subjected to pure bending.	07
Q.4	(a) Explain the Principle of virtual work.	03
	(b) Explain Hooke's law for elastic material.	04
	(c) Derive differential equations of equilibrium for an elastic body.	07
	OR	
Q.4	(a) Difference between linear and non-linear elastic isotropic stress strain relation.	03
	(b) Write down comparison between Tresca and Von-Mises theory (Plane Stress).	04
	(c) Explain Normality, Convexity and Uniqueness for an elastic solids.	07
Q.5	(a) Explain stress strain relation for work hardening material.	03
	(b) State the term Bauschinger Effect for an elasto-plastic material	04
	(c) Write a note on Druker's stability postulate for stability of work-hardening materials.	07
	OR	
Q.5	(a) State term associated flow rule benefits compared to non-associated flow rules.	03
	(b) State the term Kinematic Hardening for an elasto-plastic material.	04
	(c) Discuss flow rules associated with von Mises yield function for perfectly plastic material.	07
