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

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2142106 **Date: 30/05/2017**

Subject Name: Plastic Deformation of Metals

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		**Short Questions**	**14**
	1	Differentiate Tougness & Stiffness.	01
	2	Draw Neat schematic of "Slip" &Twin"	01
	3	Define Possion Ratio. Give range of values for metals.	01
	4	Define Resilience.	01
	5	What is Tcrss ? when it is Max & Zero. ?	01
	6	What is high & Low angle grain boundary ?	01
	7	Draw schematic of Slip bands & name the metals in which it	01
	8	Draw Staking fault schematic.	01
	9	Write 2-3 Characteristics of ductile fracture.	01
	10	Write 2-3 Characteristics of Brittle fracture.	01
	11	Define Creep. Mention the factors responsible for Creep in metals	01
	12	What is Endurance Limit?	01
	13	What is Intergranular & Transgranular crack. Draw Schematic.	01
	14	What is "Bouchinger effect" in Material ?	01
Q.2	**(a)**	Explain Grain boundary Strengthening with Neat Schematic.	**03**
	(b)	Draw Engineering & True stress strain curves. Differentiate these two curves & state the reason which curve is most referred.	**04**
	(c)	Explain the term: 1. Hook's Law 2. Young Modulus 3. Shear Modulus.	**07**
		OR	
	(c)	What are fundamental principles which govern the strengthening mechanism in metals and alloys? List various strengthening mechanisms in metallic alloys.	**07**
Q.3	**(a)**	Explain briefly the techniques of observation of dislocation.	**03**
	(b)	Define "effective stress" Write down equations for calculating effective stress under "Tresca criterion & "Von Mises Criteria".	**04**
	(c)	Why metals become hard after cold working? What should be done to remove the hardness?	**07**
		OR	
Q.3	**(a)**	When do you need to mention offset Yield strength? What is the name of corresponding stress?	**03**
	(b)	What is ductile brittle transition temperature? What is the test to measure the DBTT behavior of metal ?	**04**
	(c)	Write down procedure of "Mohr's Circle" analysis for solving Principal Stresses.	**07**
Q.4	**(a)**	Explain Solid solution strengthening with suitable example.	**03**
	(b)	Draw Fatigue Curves for Ferrous & Non Ferrous metals systems. Define fatigue Limit.	**04**
	(c)	Explain Precipitation Hardening phenomena of Al-Cu System.	**07**

OR

Q.4	**(a)**	Explain the mechanical properties of precipitates.	**03**
	(b)	Solve the Problem: - In a BCC Unit cell under uniaxial tensile stress of 52 MPa, the angle between plane normal to the slip plane & stress axis is 45°. And the angle between the slip plane & tensile axis is 54.7°. Calculate Critical Resolved shear stress.	**04**
	(c)	What is fundamental difference between edge and screw dislocation?	**07**
Q.5	**(a)**	Only draw & label different Crystal Imperfection in Solids.	**03**
	(b)	Define solid solution. Explain Hume Rothery rule for solubility of solute atoms	**04**
	(c)	Explain about the Multiplication of dislocations-Frank Reed source	**07**

OR

Q.5	**(a)**	Discuss the Properties of Precipitates in Precipitation Hardening System.	**03**
	(b)	What is Hall-Petch Equation? Which relationship is explained between Strength & Microstructural feature?	**04**
	(c)	Explain the Griffith theory of brittle fracture with neat schematic	**07**

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