Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Examination January 2010

Subject code: 710808 Subject Name: Material Science and Materials

Date: 27/01/2010 **Time: 12.00 – 2.30 pm**

Total Marks: 60

Instructions:

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

Q.1	**(a)**	Compare primary bonds of solid materials in all possible contexts	**06**
	(b)	Give your thoughts on the factors to be considered for selecting materials for engineering application.	**06**
Q.2	**(a)**	Explain Griffith's criterion for material fracture. What does modified Griffith's theory suggests?	**06**
	(b)	Explain fatigue crack propagation mechanism in the context of material. Discuss the Crack length variation with component life with schematic diagram.	**06**
		OR	
	(b)	Discuss various types of Cracks which are likely to appear in an engineering material under service conditions and briefly discuss modes of material deformation.	**06**
Q.3	**(a)**	As a design engineer, you have designed a rotor for aircraft turbine based on yield strength. Give your comments on its performance during operation. With proper justification, suggest a substitute material for the turbine rotor.	**06**
	(b)	Enlist some Smart materials with its characteristics. Briefly explain specific applications of smart materials in engineering.	**06**
		OR	
Q.3	**(a)**	Give justification for the development of Advanced materials. How Advanced Ceramic materials are Processed?	**06**
	(b)	Composite materials are all purpose materials. Evaluate the statement	**06**
Q.4	**(a)**	Give your comments on the influence of service conditions on the performance of materials.	**06**
	(b)	Explain why, on a cold day, the metal door handle of an automobile feels colder to the touch than a plastic steering wheel, even though both are at the same temperature.	**06**
		OR	
Q.4	**(a)**	Briefly explain why the thermal conductivities are higher for crystalline than noncrystalline ceramics.	**06**
	(b)	Give your thoughts on Radiation damage in materials and how damages are to be recovered.	**06**
Q.5	**(a)**	Justify the need of non destructive techniques for the material evaluation. Discuss the use of X-Rays for material evaluation.	**06**
	(b)	Discuss Debye theory stating its importance in material properties.	**06**
		OR	
Q.5	**(a)**	Discuss trends in development of Bio materials and its characterization.	**06**
	(b)	Discuss about the Development, Measurement and Mitigation of residual stresses in a welded component.	**06**

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