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Total No. of Pages : 02

Total No. of Questions : 08

M.Tech (ME) (2017 Batch) (Sem.-1)

ADVANCED ENGINEERING MATERIALS

Subject Code : MTME-101

M.Code : 74715

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

1. a) Discuss the need of selection of suitable materials for engineering applications. Define the criteria of material selection. (10+10)
b) Why HCP metals are typically more brittle than FCC and BCC metals? Explain.
2. a) Describe the influence of various alloying elements on mechanical properties of Aluminium and Titanium alloys.
b) What is Hall-Petch relation? Explain the significance of grain boundaries, grain size distribution, grain shapes and orientation used in the application of mechanical strength and high temperature/creep applications. (5+15)
3. Define Composite materials. Explain major constituents, classification and characteristics of composites with neat sketches. List few applications of composites. (20)
4. a) Describe the metal matrix composites and hybrid composites. (10+10)
b) For a polymer-matrix fiber-reinforced composite,
 - i) Write important functions of the matrix phase.
 - ii) Compare the desired mechanical characteristics of matrix and fiber phases.
 - iii) Cite two reasons why there must be a strong bond between fiber and matrix at their interface.



5. A continuous and aligned glass fiber-reinforced composite consists of 40 vol% of glass fibers having a modulus of elasticity of 69 GPa and 60 vol% of a polyester resin that, when hardened, displays a modulus of 3.4 GPa. Determine : (20)
- a) The modulus of elasticity of this composite in the longitudinal direction.
 - b) If the cross-sectional area is 250 mm^2 and a stress of 50 MPa is applied in this longitudinal direction, compute the magnitude of the load carried by each of the fiber and matrix phases.
6. a) Define shape memory effect (SME). How Shape memory alloys are useful in biomedical applications? (10+10)
- b) Define biocompatibility. Discuss the properties and application of Mg alloys as a Biomaterial.
7. a) Why surface modification of materials is highly preferable in clinical and medicine discipline? Cite few examples to illustrate the benefits of surface modification, (10+10)
- b) Discuss sol-gel technique for Nano-material production.
8. Write in brief on followings : (5×4=20)
- a) Austenitic and martensitic phases in NiTi
 - b) Nickel based super alloys
 - c) Calcium phosphate ceramics
 - d) Biodegradable Implant Materials

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.