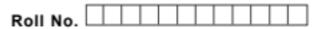


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Total No. of Pages : 02

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## 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.
- 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.
- 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)
- Define Composite materials. Explain major constituents, classification and characteristics of composites with neat sketches. List few applications of composites. (20)
- 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.

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- 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<sup>2</sup> 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.
- 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.
- 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)

(5×4=20)

- b) Discuss sol-gel technique for Nano-material production.
- 8. Write in brief on followings :
  - 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.

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