MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : ES-ME401 Materials Engineering

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]
   - (I) What do you mean by fracturing of materials?
   - (II) What is Phase Diagram?
   - (III) Which process is used to give maximum hardness to the surface?
   - (IV) What is composition of Bronze?
   - (V) What do you mean by superalloys?
   - (VI) What is stress?
   - (VII) What is the meaning of S-N curve?
   - (VIII) What is the purpose of microstructure of materials?
   - (IX) How the specimen is heated during normalizing process of steel?
   - (X) What is Strain Hardening?
   - (XI) What is the miller indices of plane parallel to x and y axes?
   - (XII) Define engineering strain.

Group-B (Short Answer Type Question)

Answer any three of the following [5 x 3 = 15]

2. Write down the name of 7 crystal system and its conventional unit cells. [5]
3. Differentiate between Annealing and Normalizing process. [5]
4. Draw the stress-strain diagram of ductile materials and identify yield points, elastic limit, fracture point, ultimate stress point etc. [5]
5. Write a short note on pearlite. [5]
6. Sketch and explain T-T-T diagram. [5]

Group-C (Long Answer Type Question)

Answer any three of the following [15 x 3 = 45]

7. (a) Define glass transition temperature. [3]
   (b) Write short note on cast-iron. [8]
   (c) What is titanium alloys ? [2]
   (d) What are the use of titanium alloys? [2]
8. (a) What is creep? [2]
   (b) Write down the stages involved in creep behaviour. [6]
   (c) Elaborate the creep mechanism. [7]
9. (a) Define Schmid law and Schmid factor. [3]
   (b) Write a short note on Recrystallization. [8]
   (c) Write the Importance of grain growth. [4]

10. A machine element is subjected to the following stresses σx = 60 MPa, σy = 45 MPa, \tau = 3 0 M p a . Find the factor of safety if it is made of C45 steal having yield stress as 353 MPa, using the following theories of failure. [15]
    (i) Maximum principal stress theory,
    (ii) Maximum shear stress theory,
    (iii) Shear energy theory, and
    (iv) Maximum strain theory taking Poisson ratio as 0.3

11. (a) Distinguish between hot and cold working. [7]

    (b) What do you mean by hardenability? [2]

    (c) What is severity of quench? [2]

    (d) Mention the factors affecting hardenability. [4]

*** END OF PAPER ***