

Z 6068

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Second Semester

CAD/CAM

CM 1601 — APPLIED MATERIALS ENGINEERING

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the reason for the discrepancy between the theoretical and observed critical shear stress in metals.
2. Does plastic deformation occur by dislocation motion for non crystalline material? State the reason.
3. What are the factors that affect the fatigue strength of a material?
4. Write down the Paris Law for crack growth rate.
5. What are the back ground to process selection?
6. Mention the factors to be considered in selection of materials for creep resistance.
7. What are the applications of HSLA steel?
8. Give the composition for any one metallic Glass.
9. Mention two names of adhesives.
10. Name any four industrially important polymeric materials.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain how plastic deformation occurs by slip in single-crystals. (8)
(ii) Explain the grain boundary strengthening with neat sketches. (8)

Or

- (b) (i) Explain the strain hardening of crystals with the help of stress-strain curve. (10)
(ii) Compute the strain-hardening exponent for an alloy in which a true stress of 415 MPa produces a true strain of 0.10. Assume a value of 1035 MPa for K. (6)
12. (a) (i) Explain the Griffith's theory of brittle fracture. (10)
(ii) What are the differences between ductile and brittle failure. (6)

Or

- (b) (i) Explain any one mechanism of crack propagation study. (10)
(ii) Determine the critical crack length for a through crack in a thick plate of aluminium alloy which is in uni axial tension. For this alloy $K_{IC} = 24 \text{ MPa} \sqrt{m}$ and $\sigma = 465 \text{ MPa}$. Assume $Y = 1.01$. (6)
13. (a) Explain the procedure involved and precautions to be made during selection of material for fatigue resistance. (16)

Or

- (b) Discuss the procedure to select the material for
(i) Automobile application and
(ii) Nuclear application. (8 + 8)
14. (a) Explain the following :
(i) Precipitation in micro alloyed steels and the effect of particle size and hardness. (8)
(ii) Maraging steel. (8)

Or

- (b) (i) Explain the method of production of metallic glass. (10)
(ii) What are the applications of metallic glasses? (6)

- (a) (i) Explain the production of any one type of fiber and its reinforcement. (10)
- (ii) Discuss the applications of fibers. (6)

Or

(b) Write short notes on the following :

- (i) Elastomers
- (ii) Tungsten carbide
- (iii) Silicon carbide. (5 + 5 + 6)