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BME-018

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) / B.Tech. AEROSPACE ENGINEERING (BTAE) / BTMEVI

00720

Term-End Examination

June, 2016

BME-018 : ENGINEERING MATERIALS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **five** of the following questions. Use of calculator is allowed.*

1. (a) A steel specimen of 10 mm diameter and 50 mm gauge length was tested in tension and the following observations were recorded :

Load at upper yield point = 20600 N

Load at lower yield point = 19650 N

Maximum load = 35550 N

Gauge length after fracture = 62·43 mm

Calculate the modulus of resilience and modulus of toughness. Also calculate % elongation. $E = 210 \times 10^3$ N/mm^2. *8*

(b) Describe the procedure for finding Brinell hardness. *6*

2. (a) Explain killed, semi-killed and rimmed steel. 6

(b) Describe cooling curve for pure iron. Will this curve change in the presence of impurity ? 8

3. (a) Describe the properties and uses of carborundum. 6

(b) Describe the aluminium alloys commonly used for engineering applications. Give their properties and application. 8

4. (a) How is rubber obtained and what are the uses of natural rubber ? 6

(b) A composite of glass fibres and epoxy has all fibres laid along the length and is required to carry a stress of 1200 MPa. The limiting stress carried by fibre and epoxy is 2400 MPa and 80 MPa respectively. The volume ratios and modulii of elasticity are described below :

$V_f = 70\%$, $V_m = 30\%$, $E_f = 72$ GPa, $E_m = 3$ GPa

The composite is stretched in the direction of fibres.

(i) Find the modulus of elasticity of the composite.

(ii) What percentage of broken fibres can be tolerated if matrix is not to be stressed more than 80% of its capacity ? 8

5. (a) In a fracture test, a 3-point bend specimen of thickness 20 mm and depth 25 mm is supported over a span of 100 mm. The specimen is precracked. The surface occurs at a load of 16513 N and crack length is measured after fracture as 10·25 mm. Calculate K_{IC} from the data. *8*

(b) Describe four types of cracks with the help of suitable examples. *6*

6. (a) Describe the term lubricant and its functions. *7*

(b) What are the purposes of coatings ? Give some applications of coatings. *7*

7. (a) Distinguish between ductile and brittle materials with the help of suitable examples.

(b) Describe the uses of Molybdenum and its alloys.

(c) How are glass fibres made ? Which matrix material suits glass fibres best ?

(d) Explain the terms tribology and friction.

$4 \times 3\frac{1}{2} = 14$