No. of Printed Pages : **4**

**BME-018**

01361

# BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)
## B.Tech. (Aerospace Engineering) (BTMEVI)

### Term-End Examination

### December, 2013

## BME-018 : ENGINEERING MATERIALS

*Time : 3 Hours* *Maximum Marks : 70*

***Note :*** *Attempt **any seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

**1.** (a) What is a phase ? What is the difference between $\alpha$ - iron and ferrite ? 5+5

(b) Explain with reasons. (***Any two***)

(i) Ceramics are very hard

(ii) Brittle fracture commonly occurs in Grey cast iron

(iii) Brass is always stronger than copper at room temperature.

**2.** (a) What is Hardenability ? Why is it not so high in plain carbon steels ? 5+5

(b) Distinguish between Diamagnetism and Paramagnetism

3. (a) A tension test recorded an engineering strain of 0.0046 against the engineering stress of 345 MPa of a material within elastic range. Find out the elastic modulus of the material. 5+5

(b) Calculate the volume of an FCC unit cell in terms of the atomic radius, R.

4. (a) Distinguish by structure and properties between thermo setting and thermoplastic resins. 5+5

(b) A thick cylinder of $r_i$ = 12 mm; $r_o$ = 84 mm carried equal and symmetric radial cracks of 6 mm long on opposite sides of inner surface. The inner surface is jacketed with a thin rubber membrane and pressurised with 2.5 N/mm$^2$ pressure. Find the stress intensity factor (SIF)

Given : Y = 0.46, where Y is Calibration factor.

5. (a) What is abrasive ? Which material are used for abrasive cutting ? 5+5

(b) Define ceramics and refractories. Discuss properties of refractory materials.

6. (a) How is aluminium produced commercially ? Discuss various applications of aluminium. 5+5

(b) What are the different heat treatment given to steel ? Differentiate between annealing and process annealing.

7. (a) Describe cooling curve for pure iron. Will this curve change in presence of impurity ? Discuss. 5+5

(b) Distinguish between metal and alloy. What are the raw materials used in blast furnace in iron making process ?

8. (a) What do you understand by hardness ? Arrange following substances from hardness to softness. 5+5

| | | | |
|---|---|---|---|
| (i) | Diamond | (ii) | Steel |
| (iii) | Copper | (iv) | Gypsum |
| (v) | Corrundum | (vi) | Calcite |

(b) What is Brinell hardness ? If for a ball of 12 mm diameter a load of 4500 kgf is applied on the ball for measuring BHN, what force will have to be applied upon a 6 mm ball ?

9. (a) Define the term coating. What are the purpose of coating ? 5+5

(b) Explain dry friction, boundary lubrication and film lubrication.

10. (a) Why does cast iron show higher compressive strength than tensile strength ? The ratio of length to diameter in cast iron compression specimen is 3 where as it is 2 in concrete specimen. Give reasons. 5+5

(b) A rod 150 cm long and of diameter 2.0 cm is subjected to an axial pull of 20 kN. If the modulus of elasticity of the material of the rod is $2 \times 10^5$ N/mm$^2$;

Determine ;

(i) the stress

(ii) the strain, and

(iii) the elongation of the rod.