Ex/MT 41C/27/2008

B. MET. ENGINEERING FINAL EXAMINATION, 2008

(1st Semester)

TECHNOLOGY OF NON-FERROUS METALS

& NON-METALLIC MATERIALS

Time : Three hours Full Marks : 100

Attempt ***any five*** question

All question carry equal marks

1. a) What are the following and where are they used ? 20
(i) 1100-H14 (ii) 5182-H12 (iii) 3004-H16 (iv) 2024-T6

   b) Select an aluminium alloy to contain lequid hydrogen fuel in a tank. Explain.

   c) Design a casting process to produce automotive wheels having reduced weight and consistent and uniform properties.

   d) A steel cable 0·5 inch diameter has a yield strength of 70,000 p.s.i. The density of steel is about 7·87 gm/cm^3. Determine (i) the maximum load that the steel cable can support (ii) the diameter of a coldworked (3004-H18) alloy required to support the same load as the steel and weight per foot of the steel cable versus the aluminium cable.

   [Density of the aluminium alloy = 2·70 gm/cm^3 yield strength of the aluminium alloy = 36,000 p.s.i.]

2. a) Give the composition, properties and application of the following :

[Turn over

(i) yellow brass (ii) Monel (iii) Aluminium bronze

(iv) zamak

b) Design the contrets for a switch or relay that opens and closes a high current electrical circuit. Give examples.

c) What are some of the major applications of magnesium & titanium alloys.

3. a) Select suitable alloy with reasons, a heat exchanger for the petrochemical industry.

b) Select suitable materials for a high performance jet engine turbine blades.

c) What are super alloys ? Give mechanism of the strengthening of super alloys.

4. a) What are the major advantages of plastics compared to ceramics, glasses and metallic materials ?

b) Compare and contrast properties of thermoplastic, thermosetting materials and elastomers.

c) Which plastics are easiest to recycle ? Which plastics are the most difficult ? Explain.

d) What is a particulate composite ?

e) What is a nano composite ? How can steels containing ferrite and martensites be described as composites ? Explain.

5. a) Explain briefly how carbon fibres are made.

b) What is the difference between a fiber and a whisker ?

c) What is a fibre reinforced composite ? What fibre renforcing materials are commonly used ? In a fibre reinforced composite what is the role of the matrix ?

6. a) Give examples of some ceramic materials that are used to make lasers.

b) What is the difference between a thin film and a coating ?

c) State applications of silica in the form of a fiber and a fine particle.

d) A Cemented Carbide Cutting tool used for machining contains 75 wt% wc, 15 wt% Tic, 5 wt% Tac and 5 wt% CO. Estimate the density of the composite.

Given : $\rho_{wc} = 15{\cdot}77$ gm/cm^3, $\rho_{Tic} = 4{\cdot}94$ gm/cm^3

$\rho_{Tac} = 14{\cdot}5$ gm/cm^3, $\rho_{CO} = 8{\cdot}90$ gm/cm^3

7. Write a brief technical note on the following : ***(any two)***

(i) Durability of concrete (ii) Polymer degradation

(iii) Metal matrix composites (iv) Smart fibre composite