DIPLOMA IN CIVIL/ELECTRICAL/ MECHANICAL ENGINEERING

01252

Term-End Examination

June, 2011

BME-050 : ENGINEERING MATERIALS

Time : 2 hours *Maximum Marks : 70*

Note : ***Question No. 1*** *is compulsory. Answer* ***any four*** *questions from remaining 5.*

1. Answer the following questions by making correct choice. **14**

Choose incorrect statement.

(a) A tension test is performed :

(i) to establish stress - strain diagram

(ii) to determine ultimate tensile strength

(iii) to find the hardness of material

(iv) to find the % elongation

(b) Which hardness measuring method makes a square impression ?

(i) Brinell (ii) Vickers

(iii) Rockwell (iv) Knoop

(c) In a creep test constant creep rate is observed

(i) from beginning to fracture

(ii) from end of transient creep to fracture

(iii) from end of transient creep to beginning of tertiary creep.

(iv) only during tertiary creep.

(d) Which is the correct order for cost of metals from lowest to highest.

(i) Steel, Zinc, Aluminium, Copper

(ii) Zn, steel, Cu, Al

(iii) Cu, Zn, Al, Steel

(iv) Al, steel, Zn, Cu

(e) Killed steel is

(i) free of Si

(ii) free of P and porosity

(iii) free of porosity and oxygen

(iv) free of slag

(f) Which will show highest % elongation intension test ?

(i) 0.2% C steel (ii) pure iron

(iii) cast iron (iv) 0.6% C steel

(g) Axles and gears are made in

(i) medium C steel

(ii) high C steel

(iii) mild steel

(iv) tool steel

(h) Choose the correct statement in respect of pearlite, a phase in steel.

(i) Pearlite has highest strength.

(ii) Pearlite is entirely cementite.

(iii) Pearlite appears silvery under microscope

(iv) Pearlite is made up of alternate layers of ferrite and cementite.

(i) If a steel part is heated 30° - 50° above A_3, soaked at that temperature for some time and then quenched in water, the phase that will precipitate is

(i) pearlite (ii) austenite

(iii) ledeburite (iv) martensite

(j) Steel part to be heat treated is heated in

(i) blast furnace

(ii) pit furnace

(iii) basic oxygen furnace

(iv) electric arc furnace

(k) Fluidity in molten cast iron is an important property because it has to be poured in moulds. Which alloying element provides fluidity ?

(i) Sulphur

(ii) Phosphorous

(iii) Silicon

(iv) Manganese

(*l*) Babbitts having silvery while appearance and used for bearing liners are alloys of

(i) Sn, Cu, Pb and Sb

(ii) Sn, Ag, Cu and Sb

(iii) Cu, Ag, Pb and Sb

(iv) Sn, Ag, Pb and Sb

(m) Choose the correct statement in respect of insulators

(i) Low temperature insulators are used below $0^{\circ}C$

(ii) Building insulators are used between $0^{\circ}C$ and $15^{\circ}C$

(iii) Industrial insulators are used between $150^{\circ}C$ and $315^{\circ}C$

(iv) Plastic, wood, porous polymeric materials are used as industrial insulators.

(n) Which fibre is not used for reinforcement ?

(i) Graphite fibre

(ii) Glass fibre

(iii) Boron fibre

(iv) Wood fibre

2. (a) What information is expected from an impact test performed on steel specimen ? Give the geometry of an impact test specimen and describe how the test is performed. 5

(b) A steel specimen of 12 mm diameter and 60 mm gauge length was tested in tension, following observations were recorded. 9

Load at upper yield point	=	29670 N
Load at lower yield point	=	28300 N
Maximum load	=	51200 N
Gauge length after fracture	=	72.2mm

Calculate modulus of resilience and modulus of toughness and % elongation. Take $E = 2.1 \times 10^5$ MPa.

3. (a) A eutectoid steel specimen is heated in a furnace to just above 720° C and soaked there for 1/2 hour. The specimen is then quenched in water, oil, air and cooled in furnace. What phases will develop after each cooling method and what ultimate tensile strength and hardness will result ? 7

(b) What is tempering ? What are different temperature ranges in which tempering is performed ? Show how major mechanical properties of steel are modified with respect to tempering temperature (Properties - VTS, Hardness, γ, P and % E long.) 7

4. (a) Describe the stainless steel, its types and applications. 8

(b) What are the effects of following alloying elements in steel ? 6

Si, Mn, Ni, Cr, Mo and V.

5. (a) What are the alloys which do not contain iron and are used for making cutting tools ? Describe their composition and applications. 6

(b) What are refractory materials and where they are used ? How are ceramics manufactured ? 8

6. (a) What is a composite material ? Give examples of composite which are fibre reinforced. List their applications. 7

(b) What is wear and how does it occur in materials ? What are different factors that influence wear ? 7