02910

DIPLOMA IN CIVIL/ELECTRICAL/ MECHANICAL ENGINEERING

Term-End Examination

December, 2010

BME–050 : ENGINEERING MATERIALS

Time : 2 hours   *Maximum Marks : 70*

Note :   *Question No. 1 is compulsory. Answer **any four** from Question No. 2 to 6. Use of non-programmble scientific calculator permitted*

Select correct answer from given four alternatives.   **14**

1.   (a)   A sharp yield point is shown by :

(i)   copper   (ii)   mild steel

(iii)   medium c steel   (iv)   cast iron

(b)   Practical definition of a ductile material is that it shows % age elongation in a tension test which is greater than

(i)   2%   (ii)   3.5%

(iii)   5%   (iv)   7.5%

(c)   A steel specimen tested in tension result in yield strength σ_y and ultimate tensile strength of σ_u. The strain at fracture is ϵ_f. The modulus of toughness is.

(i) $(\sigma_y + \sigma_u)\,\epsilon_f$ (ii) $\sigma_y\,\epsilon_f$

(iii) $\dfrac{1}{2}\sigma_u \epsilon_f$ (iv) $\dfrac{1}{2}(\sigma_y + \sigma_u)\,\epsilon_f$

(d) With increasing strain rate in a tension test consider following statements :

(1) UTS increases

(2) Y.S reduces

(3) % age elongation is not affected. Of above statements the correct statement(s) are :

(i) 1, 2 and 3

(ii) 1 and 2

(iii) Only 1

(iv) 2 and 3

(e) An impact test involves following three aspects :

(1) A triaxial state of stress (stress concentration)

(2) Low temperature,

(3) High strain rate or rapid rate of loading of these the factor(s) responsible for brittle fracture of mild steel specimen are.

(i) 1 and 2

(ii) 2 and 3

(iii) 1, 2 and 3

(iv) 1 and 3

(f) The blast furnace is charged from top with a charge consisting of :

    (i) Iron ore, limestone and coke.

    (ii) Iron ore, limestone and bituminous coal.

    (iii) Iron ore and coke.

    (iv) Iron ore and dolomite.

(g) Steel is an alloy of iron and carbon essentially with other elements present in the structure. Certain range of carbon percentage in iron does not make a usable steel. This percentage range is

    (i) 0.8 to 1.2   (ii) 0.667 to 0.87

    (iii) 1.00 to 1.4   (iv) 1.3 to 2.2

(h) With respect to carbon percentage and structure steel is classified into following groups. Choose the correct combination.

    (i) Hyper-Eutectoid steel contains carbon in excess of 0.8% and structure is pearcite and cementite.

    (ii) Eutectoid steel contains 0.87% carbon and structure is cementite.

    (iii) Hypo-eutectoid steel contains carbon in excess of 0.83% and has ferrite and pearlite in its structure.

    (iv) Hyper-eutectoid contains 0.87% carbon and structure is entirely cementite.

(i) Jomin test is performed on steel to assess its

    (i)   Hardness   (ii)   Hardenability

    (iii) Ductility   (iv) Heat treatability

(j) Tempering treatment given to steel

    (i)   Improves ductility and toughness

    (ii) Increases hardness

    (iii) Increases ultimate tensile strength

    (iv) Reduces impact strength.

(k) Choose the correct statement in respect of cast iron.

    (i)   Gray cast iron is harder and difficult to machine.

    (ii) While cast iron consists of pearlite, cementite and ledeburite in its structure.

    (iii) Gray cast iron contains greater percentage of silicon which makes it hard.

    (iv) The hardness of white cast iron varies between 150 and 320 BHN.

(l) Choose correct statement in respect of copper alloys.

    (i)   Essential contents of bronze are Cu and Zn.

    (ii) Red brass is used for making springs.

    (iii) Brass has better corrosion resistance than bronze.

    (iv) Bronze is stronger than brass and is used as bearing material.

(m) Choose the correct statement.

(i) Thermal conductivity of glass and graphite reduces with increasing temperature.

(ii) Thermal conductivity of glass reduces and that of graphite increases with increases temp.

(iii) Thermal conductivity of glass increasing and that of graphite reduces with increasing temp.

(iv) Thermal conductivity of glass and graphite is not affected by increasing temp.

(n) Best combination of strength, density and modulus of elasticity is available in

(i) Carbon fibre   (ii) Glass fibre

(iii) Kelvar   (iv) Boron fibre.

2. (a) A mild steel specimen is held in a universal   9
testing machine and gradually pulled until the fracture occurs. Draw the load elongation diagram and mark following points.

(i) Elastic limit

(ii) Upper and lower yield points

(iii) Ultimate tensile strength.

Define percent elongation and indicate how it can be measured from above diagram.

(b) A tension test specimen records 40,000 N   5
force over a period of $\frac{1}{2}$ min. During this
time the initial gauge length of 100mm
changes to 115mm. If the mechanical
efficiency of the machine is 75%. Calculate
power consumed by electric motor.

3. (a) Sketch a blast furnace and mark various   7
reaction zones on the sketch. Show how
the slag and iron are tapped separately.
What is the slag and what are its uses ?

(b) What is a plain carbon steel ? How is plain   7
carbon steel classified ? Describe
applications of plain carbon steels.

4. (a) Describe a Time- Temperature-   8
Transformation diagram for plain carbon steel.
How can you obtain such a diagram ? What
is the use of T-T-T diagram. Explain by giving
examples of austempering and mar
tempering.

(b) What are the effects of alloying elements like   6
S,P,Si and Mn in plain carbon steel. The
alloy steel containing Ni,Cr and V are
commonly used. What properties do these
elements provide in alloy steels?

5. (a) Brass, Bronze, Monet metal and German 7
Silver are common alloys of Cu. Describe
the alloying elements in each and mention
at least one application of each alloy.

(b) What are the desirable properties in a 7
bearing material ? describe alloys that are
used as bearing materials.

6. (a) What is a polymer and what is 7
polymerization ? Distinguish between
addition polymerization and condensation
polymerization. Describe three application
for three polymers (one each)

(b) What is wear ? What are different method 7
of reducing wear of materials. Describe
carburizing and cyniding treatments for
steel components.

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