(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4068 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. III) ODD SEMESTER THEORY EXAMINATION 2010-11

MATERIALS SCIENCE

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt all **five** questions.

(2) All questions carry equal marks and they are shown against each question.

(3) Avagadro's number is 0.6023×10^{24}.

1. Answer any **two** parts of the following : **(10×2=20)**

(a) Describe the modern concept of the atomic model.

(b) What is the coordination number ? Explain your answer with the help of a sketch, taking the example of a simple cubic lattice.

(c) (i) The density of iron is $7.86 g/cm^3$. Its atomic weight is 55.85. Calculate its atomic radius assuming B.C.C. structure.

(ii) Sodium Chloride Crystals having F.C.C. structure have a density of 2.18 g/cm^3. Calculate its lattice-constant. Molecular weight of NaCl equals 58.5.

2. Answer any **four** parts of the following : **(5×4=20)**

(a) Draw a tensile stress-strain diagram for a material like mild steel and mark the following points on it :

(i) Limit of proportionality,

(ii) Elastic limit,

(iii) Lower and higher yield points,

(iv) Ultimate tensile strength (U.T.S), and

(v) Breaking strength

What information about stiffness and toughness of test material is revealed by this curve ?

(b) Describe the procedure of hardness testing on a Rockwell tester. For which materials are scales A, B and C used ?

(c) What is endurance limit ? What is its significance for parts subject to fatigue ?

(d) How is grain size of a sample ascertained ?

(e) State and explain the phase-rule.

(f) Draw a solid-solution type of equilibrium diagram and explain briefly the changes which take place when an alloy of a particular composition begins to solidify and cools.

Explain the phenomenon of "coring".

3. Answer any **two** parts of the following : **(10×2=20)**

(a) (i) What are the basic differences between cast iron and and carbon steel ?

(ii) Plain carbon steel always contains some manganese and silicon. Then why is plain carbon steel not considered an alloy steel ?

(iii) Write a brief note about "ferrite-stabilisers" and "austenite stabilisers " and their role in stainless steel.

(iv) What are silico-manganese steels used for ?

(b) What are the conditions for formation of martensite and bainite ? Explain with the help of time-temp-transformation diagrams.

(c) Differentiate between brasses and bronzes. Is gun-metal a brass or bronze ? What do you understand by "season cracking" and dezincification ?

4. Answer any **two** of the following : **(10×2=20)**

(a) Write a brief account of "energy band theory" and explain the difference between conductors, semiconductors and insulators on the basis of this theory.

(b) What do you understand by magnetic hysteresis ? What role does it play in the operation of transformers ?

(c) Explain what is a thermistor and the different uses it can be put to.

5. Answer any **four** parts of the following : **(5×4=20)**

(a) How is a ceramic material defined ? How is it different from "cermet" ? Name any two ceramic material tools used for machining of metals.

(b) What are fibre-reinforced plastics ? What kind of fibres are used and why ?

(c) Name different types of glasses. What are the properties of borosilicate glasses ?

(d) What are the advantages of using twisted steel bars in R.C.C ? What other reinforcing material is used in cement-concrete ?

(e) Describe the property of viscoelasticity. What is relaxation modulus ?

(f) What is the common classification method for classifying plastics ? Name some thermoplastics used in household.