ME III

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No. of Printed Pages—5

ME—301

B. TECH

THIRD SEMESTER EXAMINATION, 2002-2003

MATERIALS SCIENCE

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt ALL Questions. There may be choices within questions.

(2) Q.1 carries 20 marks and other questions carry 16 marks each.

(3) Marks are also indicated therein.

(4) Answer briefly and neatly. No negative marking.

1. Answer ALL parts as directed :— (2×10=20)

(*a*) (*i*) Name the second India-born scientist who got Nobel prize in Physics, after C.V. Raman, on his work on Astro-physics on the Limit named after his name.

(*ii*) Bismark said like this, 'for development of a Nation you don't need lectures and meetings but what you need are blood and steel'. This stong iron-man has been chancellor of Germany. Name the chemical element which is common in 'blood and steel'.

(*b*) Write the materials for —

(*i*) Filament of electric bulb

(*ii*) Twist drill tool

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(c) (*i*) Write chemical symbol of Tin.

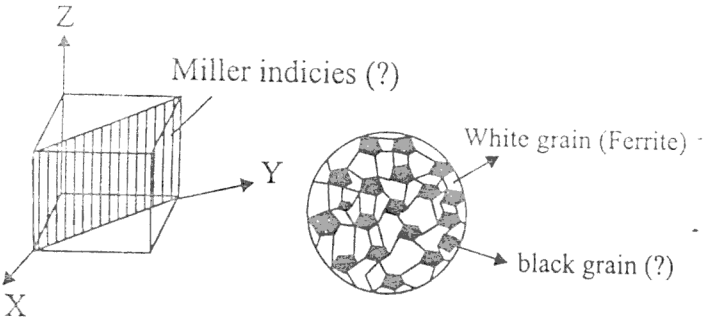
(*ii*) Write chemical formula for Teflon plastic.

(*d*) (*i*) Write approximate % of C in mild steel.

(*ii*) Write the approximate melting point of cast-iron.

(*e*) (*i*) Write Miller indices for the diagonal plane shown below.

(*ii*) Write the name of the black constituent shown below in the micro-structure of mild steel.



(*f*) Fill in the blanks :

(*i*) Zinc coating over carbon steel to prevent corrosion is called _____ .

(*ii*) The point corresponding to 723 °C and 0·83% C in Fe-C diagram is called _____ point.

(*g*) State, whether True or False :

(*i*) Steel reinforcement in concrete building is done to take up tensile stress.

(*ii*) 'Cryogenic' means Science of Low Temperature.

(*ii*) Write full forms of Govt. Organisations (*i*) SAIL (*ii*) NALCO related with certain metals.

(*i*) (*i*) Name the furnace for cast-iron

(*ii*) Name the State in which Rourkela steel plant is situated.

(*j*) Name (not composition) the two main alloy elements present in —

(*i*) White metal ;

(*ii*) Duralumin.

2. Answer any TWO of the following :— **(8×2=16)**

(*a*) Briefly describe Bohr's Atomic Model and derive the formula for Line-spectra of Hydrogen (or hydrogen-like) atom as —

$$\frac{1}{\lambda} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

(*b*) Calculate the radius of iron atom (BCC) for which density is 7·8 gram/cc and Atomic weight is 55·8 gram/mole.

(*c*) Derive Bragg's Equation and enlist X-ray crystallographic methods. Briefly describe one of the methods.

3. Answer any TWO of the following :— **(8×2=16)**

(*a*) Briefly describe Vickers, Brinell and Rockwell Hardness Testings.

(*b*) What is Toughness ? Show toughness on $\sigma - \varepsilon$ diagram. Briefly describe Izod and charpy impact-tests. What is the importance of ductile-brittle transition (temperature) for cryogenic applications ?