Code : 021305

2012

MATERIAL SCIENCE

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

*(ii) There are **NINE** questions in this paper.*

*(iii) Attempt **FIVE** questions in all.*

*(iv) Question No. **1** is compulsory.*

1. Answer any *seven* sub-questions (Select correct answer/Fill in the blanks) : 2×7=14

(a) The cupola is used to make

(i) pig iron

(ii) steel

(iii) wrought iron

(iv) cast iron

(b) Iron has the unique characteristic of being

(i) paramagnetic

(ii) dielectric

(iii) ferromagnetic

(iv) ferroelectric

(c) Monel metal is an alloy of —— and ——.

(d) Cermets are

(i) metals for high temperature use with ceramic like properties

(ii) ceramics with metallic strength and lustre

(iii) coated tool materials

(iv) metal-ceramic composites

(e) Nanocomposite materials are highly preferable in design considerations for their

(i) vibration resistance

(ii) high resistance to crack propagation

(iii) impact resistance

(iv) high resilience

(f) The steel products which are required to be shock resistant should have

(i) high toughness

(ii) low hardness

(iii) high yield stress

(iv) low percentage of carbon

(g) Which of the following structures has maximum hardness?

(i) Cementite

(ii) Austenite

(iii) Pearlite

(iv) Martensite

(h) An iron-carbon binary alloy has 0·5% carbon by weight. What is this alloy called?

(i) Eutectoid

(ii) Eutectic

(iii) Hypoeutectoid

(iv) Hypereutectoid

(i) As per Gibbs' phase rule, if the number of components is equal to 2, then the number of phases will be

(i) ≤ 5

(ii) ≤ 4

(iii) ≤ 3

(iv) ≤ 2

(j) Tempering temperature of most of the materials is of the order of

(i) 100 °C to 150 °C

(ii) 200 °C to 300 °C

(iii) 350 °C to 400 °C

(iv) 400 °C to 500 °C

9. Write short notes on the following : 14

(a) Whiskers

(b) Glass fibre-reinforced polymer composite

(c) Tempered martensite

(d) Hume-Rothery rule

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