



17303

15162

3 Hours / 100 Marks

Seat No.

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- Instructions :**
- (1) *All questions are compulsory.*
 - (2) *Answer each next main question on a new page.*
 - (3) *Illustrate your answers with neat sketches wherever necessary.*
 - (4) *Figures to the right indicate full marks.*
 - (5) *Assume suitable data, if necessary.*
 - (6) *Use of Non-programmable Electronic Pocket Calculator is permissible.*
 - (7) *Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.*

	Marks
1. Solve any ten :	20
a) State any two uses of OHNS.	2
b) State any two applications of low carbon steels.	2
c) Give any two uses of gray cast iron.	2
d) State any two uses of Duralumin.	2
e) State any two applications of aluminium bronzes.	2
f) Classify metallic materials.	2
g) State any two advantages of non-ferrous materials over ferrous materials.	2
h) Define ductility and brittleness.	2
i) State any two purposes of heat treatment.	2
j) Classify annealing depending upon specific purpose.	2
k) What is hardening ? Write any two quenching media.	2
l) State any four mechanical properties of an engineering metal.	2
m) State any two types of case hardening methods involving thermo-chemical treatment.	2
n) Classify cast irons on the basis of form of carbon present in them.	2

P.T.O.



	Marks
2. Solve any two :	16
a) Define following phases :	8
i) Cementite	
ii) Austenite	
iii) Ferrite	
iv) Martensite.	
Also state associated crystal structures for above mentioned phases.	
b) i) Define phase. What do you mean by a phase diagram ?	4
ii) Draw a neat labelled sketch of phase diagram for an isomorphous alloy.	4
c) Draw the iron-carbon equilibrium diagram and label all the phases. Also, represent (i) Key temperatures, (ii) Phase reactions and (iii) Composite microstructures on it.	8
3. Solve any four :	16
a) Why is tungsten so-important as a constituent of High Speed Steels (HSS) ?	4
b) Differentiate between :	
i) Bainite and Pearlite based on mechanical properties of (a) strength (b) ductility.	2
ii) Fine pearlite and coarse pearlite based on mechanical properties of (a) hardness (b) ductility.	2
c) Which stainless steel is best suited for surgical instruments ? Explain.	4
d) What is carburizing ? How it is done ?	4
e) State any four benefits of annealing.	4
f) What are the principal advantages of austempering compared with the conventional quench and temper method ?	4
4. Solve any two :	16
a) i) Sketch an Isothermal-Transformation (I-T) diagram for an eutectoid (0.8% C) plain carbon steel ; and	4
ii) a) Show a cooling curve that will result in a structure of 100 percent martensite ;	2
b) Show a critical cooling curve.	2
b) i) Draw unit cells of following crystal structures :	
a) Face-centered cubic.	2
b) Body-centered cubic.	2
ii) Calculate packing efficiency for FCC crystal structure.	4



- c) State any two improved mechanical properties of plain carbon steels when following alloying elements are added to it :
- i) Chromium
 - ii) Nickel
 - iii) Manganese
 - iv) Molybdenum. 8
- 5. Solve any four :** **16**
- a) State any four characteristics of aluminium alloys. 4
- b) State any two examples of following classes of composite materials :
- i) Laminated
 - ii) Fiber-reinforced. 4
- c) State any four differences between a thermoplastic and a thermosetting material. 4
- d) List different types of rubber. 4
- e) Draw flowchart for different types of heat treatment processes. 4
- f) State the chemical composition for following steels : 4
- i) 40 Cr 4 Mo 3
 - ii) 40 C 8
 - iii) 20 Cr 18 Ni 2
 - iv) X 20 Cr 18 Ni 2.
- 6. Solve any four :** **16**
- a) Give any two uses for following polymeric materials :
- i) Phenol formaldehyde
 - ii) Bakelite. 4
- b) Describe the application of powder metallurgy for the manufacturing of porous bearings. 4
- c) Explain the technique of powder metallurgy. 4
- d) Which nondestructive testing method is best suited to following situations ? 4
- i) To determine the wall thickness at the bottom of a steel tank.
 - ii) To sort out bars of mixed steel.
- e) State any four characteristics of unalloyed copper. 4
- f) State any four desirable properties of bearing materials. 4
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