

Con. 5799-09.

(REVISED COURSE)

SP-8528

(4 Hours)

[Total Marks : 100

- N.B.:** 1) Question No. 1 is **compulsory**.
2) Attempt any **four** questions out of remaining **six** questions.
3) In **all** solve a total of **five** questions.
4) Figures to the right indicate **full** marks.
5) Illustrate answers with **neat** sketches, wherever **required**.
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1. (a) Explain various stages of solidification mechanism of an ingot. Use neat and labelled sketches to illustrate your answer. [6]
- (b) State and explain the **formation** of four principal types of ingot defects and also suggest preventive measures to minimize the occurrence of such defects. [8]
- (c) Give reasons:- [6]
- i) Plastic deformation can be explained by motion of Dislocations.
- ii) Edge dislocations can not cross-slip.
2. Differentiate between:-
- (a) Single crystals and polycrystalline materials.
- (b) Slip and twinning.
- (c) Plain Carbon Steels and High Strength Low Alloy Steels.
- (d) Gray Cast Iron and Nodular Cast Iron. [20]
3. (a) Draw neat and labelled Fe-Fe₃C diagram and explain its **industrial significance**. [10]
- (b) Explain the processes of Annealing and Normalizing heat treatments. [6]
- (c) Explain the importance and applications of any one of the surface hardening processes. [4]

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4. Explain the following statements: –
- (a) Aluminium alloys find applications in aero-space industry.
 - (b) The element Chromium is used in High Carbon High Chromium steels (HCHCr).
 - (c) Zinc-based alloys are used as die-casting alloys.
 - (d) The element Nickel is used in super-alloys. [20]
5. (a) Explain, in brief, at least two types of Stainless Steels in terms of properties and applications. [8]
- (b) Explain the role of Molybdenum in Creep-resistant steels. [6]
- (c) Illustrate, with the help of a suitable sketch, fundamental aspects of CCT diagrams. [6]
6. (a) Define and explain the following terms with the help of Phase Diagrams:
(i) Eutectic Reaction, (ii) Eutectoidal Reaction, (iii) Peritectic Reaction. [12]
- (b) Compare, in the form of a Table, the properties of Engineering Ceramics with the properties of Metallic Alloys, giving relevant examples of applications. [8]
7. Write short notes on any **four** of the following: –
- (i) Types and Classification of Polymers.
 - (ii) Rule of Mixtures in Composites.
 - (iii) Nano-structured Materials.
 - (iv) Slip Casting in Powder Metallurgy.
 - (v) Industrial importance of Powder Metallurgy.
 - (vi) GFRP Composites. [20]
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