

Subject:- ENGINEERING MATERIALS & METALLURGY
SEMESTER - III

BRANCH:- MECHATRONICS

Q.1 (a) Describe toughening mechanism in ceramics

- crack bridging
 - prestressing
 - crack deflection by impediment
 - Viscous & fiber pullout
 - Transformation toughening
 - Load transfer / Modulus transfer
- } 1 Mark each

Q.1(b) Describe types of Cast iron & explain applications of Grey & White cast iron.

- Grey Cast iron, White cast iron, Nodular Cast iron, Malleable cast iron } 1M
- Application of Grey Cast iron } 2M
- Application of White cast iron } 2M

Q.1(c) Describe different point Defects in crystals. Interstitial, vacancy, frenkel, schottky } 1M
 Description of each } 1M each.

Q.1(d) Explain semiconductor material alongwith two exs.
 Example alongwith explanation
 sem. definition → 1M

example ① Silicon - 1M + Explⁿ - 1M

② Boron - 1M + Explⁿ 1M

Q.1(c) Enlist unique features of nano-structured materials.

Any five features/properties - 1 M each.

Q.2(a) Types of surface defects, stacking fault
Grain boundary.

Surface defects

Edge dislocⁿ

Screw dislocⁿ

twinning

expⁿ of all + diag^m

} 2 Marks each

Stacking fault
+

Grain boundary

expⁿ + diag^m

} 2 M each

Q.2(b) Types of magnetic Materials

Paramagnetic

~~04 M~~

Ferromagnetic

~~03 M~~

Ferrimagnetic

~~03 M~~

} 02 Marks each

metallic magnetic materials } 2 Marks

Overall Applications

} 2 Marks.

Q.3(a) Difference between ductile & brittle fracture

- (1) steps (1M)
- (2) crack propagation - 0.1M
- (3) Deformation (1M)
- (4) Necking & surface (1M)
- (5) Examples (1M)
or any other point (1M) each
apart from above.

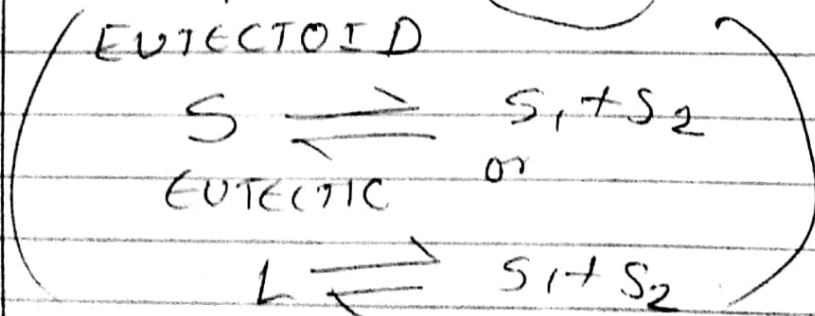
Q.3(b) Definition of fatigue (2M)

- significance of cyclic stress
or

Large no. of cycles with low stress
magnitude leads to early failure (3M)

Q.3(c) Annealing
Normalizing
Tempering
Surface Hardening } Explan } 2 1/2 Marks each.

Q.4(a) Iron-Iron Carbide diagram (5M)
Explan → (5M)



Q.4 (b) Smart materials

Definition (2M), Examples (3M),
Chronic materials (5M)

Q.5 (a) Classification of polymers
any four types

eg. Thermoplastics, elastomers, etc. (2)
1M each

→ Elastomers Explⁿ (3M)

→ Thermosetting (3M)

Q.5 (b) Creep Testing Mechanism

- Diagram (3M)

- Graph - primary - secondary - Tertiary
Creep (3M)
2-3M

- Explanation - (4M)

Q.6 (a) Copper alloys Alfa, Alfabeta

→ Brasses < 2 types → 2M each

→ Bronzes < 3 types → 2 marks each
Gunmetal, Muntzmetal etc.

→ along with properties, composition, applications etc.

Q.6 (b) Lasers → Design (1M)
Construction (1M) - Working - Diagram (1M)
explan 1M

Q.6 (c) Optical fiber commⁿ

- Construction, diagram, working
Properties, refractive index, applⁿ } 1M each