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**Question Paper Code: 93706**

B.E./B.Tech. DEGREE EXAMINATION, MAY 2022

Third Semester

Mechanical Engineering

19UME306– MATERIALS ENGINEERING

(Regulation 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. First material known to be used by man CO1- R  
(a) Cotton                      (b) Bronze                      (c) Iron                      (d) Rock
2. Brass is an alloy of CO1- R  
(a) brass and zinc              (b) brass, tin and zinc              (c) copper and tin              (d) none of these
3. Annealing is done to CO1- R  
(a) reduce carbon percent                      (b) change in crystalline structure  
(c) reduce hardness                      (d) soften the metals
4. Which carburizing method has high production rate? CO1- R  
(a) Pack carburizing              (b) liquid carburizing              (c) gas carburizing              (d) All of the above
5. % C in medium carbon steels ranges from \_\_\_\_\_. CO1- R  
(a) 0.3 – 0.4                      (b) 0.3 – 0.5                      (c) 0.3 – 0.6                      (d) None of the above
6. Stainless steel is so called because of its \_\_\_\_\_. CO1- R  
(a) High strength              (b) High corrosion resistance              (c) High ductility              (d) Brittleness
7. Rubber is a CO1- R  
(a) Thermoplastic polymer              (b) Thermosetting              (c) Elastomer              (d) Fiber
8. Density of ceramics compare with metal CO1- R  
(a) Very high                      (b) same                      (c) Low                      (d) unpredictable

9. Slow plastic deformation of metals under a constant stress is known as CO1- R
- (a) Creep (b) Fatigue
- (c) Gradual deformation (d) Endurance limit
- 10 Tensile test can be performed on CO1- R
- (a) Impact testing machine (b) universal testing machine
- (c) Rockwell tester (d) Brinell tester

PART – B (5 x 2= 10 Marks)

- 11 Define solid solution.. CO2- U
- 12 Mention few application of induction hardening? CO2- U
- 13 What is HSLA? CO2- U
- 14 What is polymerization? CO4- U
- 15 Distinguish between slip and twinning CO5- U

PART – C (5 x 16= 80 Marks)

- 16 (a) Distinguish the solid solution and compare substitutional and interstitial solid solution CO2-U (16)
- Or
- (b) How will you plot binary phase diagram for two metals which are completely soluble in liquid and completely insoluble solid state?. CO2-U (16)
- 17 (a) Give a detailed account on annealing, normalizing, hardening and tempering CO2-U (16)
- Or
- (b) Define the following surface hardening process: CO2-U (16)
- (a) Carburishing (b) Nitriding (c) Cyaniding (d) Carbonitriding.
- 18 (a) What are the main classifications of stainless steel? Explain them CO2-U (16)
- Or
- (b) Write an engineering brief (composition, heat treatment, properties) about the following steels: [a] Tool steel [b] HSLA steel [c] Maraging steels CO2-U (16)
- 19 (a) Describe the difference between thermoplastics and thermosetting plastics. CO4-U (16)

Or

- (b) What are ceramics? List and briefly explain five important properties of ceramics that make them useful engineering materials. Explain the main classification of ceramic materials. CO4-U (16)
- 20 (a) Describe a Brinell hardness test to determine the hardness of a metal. CO3-U (16)
- Or
- (b) Explain the procedure for performing the Rockwell test. CO3-U (16)