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Question Paper Code: R3908

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2025

Third Semester

Chemical Engineering

R21UCH308 – ENGINEERING MATERIALS FOR PROCESS INDUSTRIES

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. When hardness is measured under dynamic loading conditions, it is known as _____ hardness CO1-U
(a) Brinell (b) Rebound (c) Knoop (d) Rockwell
2. Which of these are applications of grey cast iron? CO1-U
(a) Camshafts, engine blocks (b) Wear plates, pump linings
(c) Brake shoes, pedals (d) Gears, rocker arms
3. What happens when Manganese is added to steel? CO1-U
(a) Decreases strength and hardness of steel
(b) Improves corrosion resistance
(c) Decreases ductility
(d) Improves strength and hardness of steel
4. Alloy steels containing 0.05% to 0.15% of alloying elements are called a CO1-U
(a) Weathering steel (b) Stainless steel
(c) Tool and die steel (d) Micro alloyed steel
5. Lead is mostly used for which purpose? CO1-U
(a) Oxides (b) Batteries (c) Cables (d) Pipes

6. Magnesium alloys are _____ and _____ CO1-U
 (a) Non-magnetic, non-sparkling (b) Magnetic, sparkling
 (c) Non-magnetic, non-sparkling (d) Magnetic, non-sparkling
7. In which temperature range is Gamma Prime phase of nickel-based superalloys unstable? CO1-U
 (a) 100-200 °C (b) 200-400 °C
 (c) 600-850 °C (d) 850-1000 °C
8. Silicones are called inorganic polymers due to absence of _____ in the main backbone chain. CO1-U
 (a) Nitrogen atom (b) Oxygen atom (c) Carbon atom (d) Hydrogen atom
9. How can cryogenic temperatures lower than 30,000K be measured? CO1-U
 (a) Silicon diode (b) Calorimeter
 (c) Superconducting granules (d) Roton detector
10. Porcelain is a type of _____ ceramic. CO1-U
 (a) Whiteware (b) Stone (c) Abrasive (d) Cement

PART – B (5 x 2= 10 Marks)

11. What does Brinell test mean? CO1-U
12. What are the types of carbon steels available and write its composition. CO1-U
13. Give some applications for aluminium. CO2-App
14. What are the materials of construction options for chemical process plants? CO1-U
15. Write the disadvantages of cryogenics? CO2-App

PART – C (5 x 16= 80Marks)

16. (a) Discuss the various micro hardness tests for Shore scleroscope. CO2-App (16)
 Or
 (b) Discuss the importance of physical, chemical and mechanical properties of materials in engineering applications. CO2-App (16)
17. (a) Explain in details about the Open Hearth Steel manufacturing process. CO1-U (16)
 Or
 (b) Describe in detail about the properties of alloys and explain each. CO1-U (16)

18. (a) Illustrate about the Bayer process of aluminum manufacturing method with a suitable diagram. CO5-App (16)
- Or
- (b) Write about the Role of Zinc, Magnesium in Engineering Materials. CO5-App (16)
19. (a) Explain in detail how refractories play a crucial role in high-temperature industrial processes by providing the necessary durability and resistance to extreme conditions. CO1-U (16)
- Or
- (b) Evaluate about the types of polymerization & its applications. CO1-U (16)
20. (a) Analyze the response provides a comprehensive exploration of the various aspects of cryogenics in space. CO4-Ana (16)
- Or
- (b) With neat sketch briefly about the production and behavior of biomaterials. CO4-Ana (16)

