**A** **Reg. No. :** | | | | | | | | | | |

**Question Paper Code: 55702**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Fifth Semester

Mechanical Engineering

15UME502 - ENGINEERING MATERIALS AND METALLURGY

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The material which has more than 6.67% carbon content is known as CO1- R

(a) Pure iron (b) Mild steel (c) Graphite (d) Cast iron

2. The mixture of α-ferrite and cementite is called as _____ CO1- R

(a) Ledeburite (b) Pearlite (c) Austenite (d) Both a. and b.

3. Which process is used to remove internal stresses from a metal? CO2- R

(a) Annealing (b) Cold working (c) Both a. and b. (d) None of the above

4. Hot working tool steels can be case hardened by the process of CO2- R

(a) Carburizing (b) Carbonitriding

(c) Nitriding (d) Induction Hardening

5. The ability of a material to resist fracture due to high impact loads, is called CO3- R

(a) Strength (b) Stiffness (c) Toughness (d) Brittleness

6. Which of the following property is desirable for materials used in tools and machines? CO3- R

(a) Elasticity (b) Plasticity (c) Ductility (d) Malleability

7. In white cast irons, carbon is present as_____ CO4- R

(a) Graphite flakes (b) Graphite nodules

(c) Cementite (d) Carbon does not exist

8. _____ steel widely used for motor car crankshafts CO4- R

(a) Nickel steel (b) Nickel-Chrome steel (c) Silicon steel (d) Chrome steel

9. PVC stands for CO5- R

(a) Poly vinyl carbonate (b) Plastic very compact

(c) Polyvinyl chloride (d) Polythene vinyl chloride

10. Which one is not a major contributor of engineering ceramics CO5- R

(a) SiC (b) $SiO_2$ (c) $Si_3N_4$ (d) $Al_2O_3$

PART – B (5 x 2= 10 Marks)

11. Define Peritectic and Eutectoid reactions. CO1- R

12. Mention the different methods of heat treatment. CO2- R

13. Differentiate between slip and twinning mechanism. CO3- R

14. List any four important mechanical properties of materials. CO4- R

15. List any four engineering ceramics. CO5- R

PART – C (5 x 16= 80Marks)

16. (a) Explain the iron – iron carbide diagram with neat sketch and discuss the different phases and reactions that takes place in it. CO1- App (16)

Or

(b) What is a solid solution? Explain the types of solid solutions. CO1- App (16)

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| 17. | (a) | Explain the Isothermal Transformation diagram for a eutectoid Iron- Carbon alloy with cooling curves. | CO2 -App | (16) |
| | | Or | | |
| | (b) | Explain any two methods of carburizing based on the process and mention its advantages and limitations. | CO2- Ana | (16) |
| 18. | (a) | List the various types of hardness testing. Explain the testing procedure for Rockwell hardness test and mention the advantages and limitations. | CO3- Ana | (16) |
| | | Or | | |
| | (b) | Write down the procedure for preparing Charpy and Izod specimens for impact testing and also explain how testing is performed. | CO3- Ana | (16) |
| 19. | (a) | Enumerate the composition and properties of malleable and white cast iron. | CO4-U | (16) |
| | | Or | | |
| | (b) | Discuss any two copper base alloys. Give its composition, properties and uses. | CO4- Ana | (16) |
| 20. | (a) | What are the different types of polymers? Explain any four types of polymers and its applications. | CO5-U | (16) |
| | | Or | | |
| | (b) | List the important engineering ceramic materials and discuss its general applications in various engineering fields. | CO5-U | (16) |