



R20 Regulation
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 3P3CE

B.Tech III Semester Regular Examinations, February 2022

METALLURGY AND MATERIAL SCIENCE
(Mechanical Engineering)

Maximum Marks: 70

Date: 25.02.2022 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Define packing efficiency. What is the packing efficiency of HCP?
- 2 How does the grain size affect mechanical properties?
- 3 Give the typical Eutectic reaction.
- 4 List the limitations of phase rule.
- 5 Mention a few methods of surface hardening.
- 6 Name the alloying elements in high-speed steel.
- 7 Compare the composition of brass and bronze.
- 8 What is sintering?
- 9 List the applications of PTFE.
- 10 State any two properties of ceramics.

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 (a) Discuss about substitutional solid solution with an example. 7M
(b) What type of solid solution is Fe-C? Where does carbon atoms occupy in ferrite? 3M
- OR
- 12 (a) Give a brief account of grains and grain boundaries. What is ASTM grain size number? 6M
(b) Discuss the effect of alloying elements like silicon and vanadium on steel. 4M
- 13 Explain the major features of a phase diagram for a generic single-component system. 10M
- OR
- 14 Explain the Eutectoid reaction with a phase diagram. 10M
- 15 Explain the isothermal transformation diagram for Eutectoid Iron-Carbon alloy with superimposed cooling curves.
- OR
- 16 Draw the iron-iron carbide phase diagram and discuss the different invariant reactions present in it. 10M

- 17 (a) How are titanium alloys classified? Mention their composition, properties and applications. 5M
(b) Mention the types and applications of stainless steel. 5M
OR
- 18 (a) Discuss about grey cast iron. 5M
(b) Discuss the characteristics of any two copper alloys, their composition, properties and applications. 5M
- 19 (a) Describe the composite materials based on type of reinforcements. 6M
(b) Discuss the properties and applications of following ceramics: Si_3N_4 , Al_2O_3 4M
OR
- 20 Describe the structure, properties and applications of following polymers: PP, PC, PEEK, ABS and PS. 10M