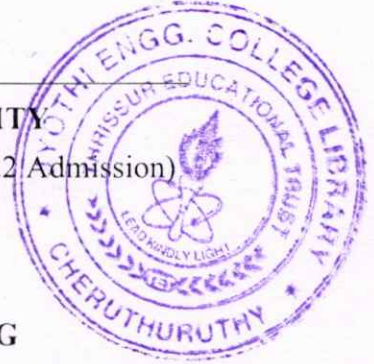


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech (Hons.) Degree Examination June 2024 (2022 Admission)

**Course Code: MET296****Course Name: MATERIALS IN MANUFACTURING**

Max. Marks: 100

Duration: 3 Hours

PART A*(Answer all questions; each question carries 3 marks)*

		Marks
1	List and brief on the structural parameters in high temperature deformed metals.	3
2	With the help of figures, show the representation of directions and planes of a hexagonal crystal structure using miller indices.	3
3	Why remelting is essential in the production of superalloys?	3
4	Explain the requirement of superalloys in gas turbine engines.	3
5	List the brittle phases in superalloys. Which are the elements causing the formation of brittle phases?	3
6	Why are cast superalloys preferred over wrought alloys in turbine blades?	3
7	Explain shear banding in Ti.	3
8	Write a note on heat treatment of Titanium.	3
9	What are maraging steels?	3
10	Explain about TZC?	3

PART B*(Answer one full question from each module, each question carries 14 marks)***Module -1**

- | | | |
|----|---|----|
| 11 | a) Explain the different mechanisms of creep deformation. | 6 |
| | b) What are the different primary and secondary bonds? Give properties associated with each bond. | 8 |
| 12 | a) Explain different strengthening mechanisms of crystalline solids. | 10 |
| | b) Explain the formation and characteristics associated with sub-grains in creep deformation. | 4 |

Module -2

- | | | |
|----|--|----|
| 13 | With a detailed diagram, explain elaborately the procedure, metallurgy, process specifications of VIM. | 14 |
|----|--|----|

- 14 Explain the process of ESR with neat diagrams. Give the advantages and challenges of ESR of superalloys. 14

Module -3

- 15 a) Write a brief note on Iron-Nickel base superalloys. 7
 b) Write a brief note on nickel-based superalloys. 7
- 16 a) Explain the different phases in superalloys. 10
 b) Differentiate wrought and cast alloys. 4

Module -4

- 17 Elaborate the behaviour of single crystal superalloys under creep and under fatigue. 14
- 18 a) Explain different techniques of manufacturing single crystal superalloys. 8
 b) Discuss the different steps in investment casting. 6

Module -5

- 19 a) Write a note on heat treatment of maraging steel. 6
 b) Write a note on TZM 4
 c) Write note on Hume-Rothery phases 4
- 20 a) Explain the production of Mo metal. 8
 b) Explain the effects of Mo alloying. 6