

M.TECH MATERIAL ENGG FIRST YEAR SECOND SEMESTER – 2025

SUBJECT: HIGH TEMPERATURE MATERIALS

Time: 3 hours

Full Marks: 100

Answer any four (4) questions.

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| 1 | What is the allowable creep strain in materials? Why is tempered martensitic microstructure of steel used in high temperature application? Is recovery desirable in high temperature materials? What are the uses of Chromium, Titanium and Aluminum in Nickel based superalloys? What are the hardening and aging treatments of Nickel based superalloys? | 2+7+
5+4+
7 |
| 2 | Why is dispersion strengthened alloy chosen at high temperature? What are the annealing treatments in α (alpha) and β (beta) Titanium alloys? What are strengthening in Nickel based superalloys? | 8+8+
9 |
| 3 | What is striation? What are the different stages of fatigue crack growth? What are the uses of coating in resisting high temperature fatigue? What is the method to represent fatigue damage? What is the damage under creep fatigue interaction? | 3+8+
8+3+
3 |
| 4 | What are the uses of tungsten at high temperature? What is the temperature of use of Fireclay? What are the effects of formation of liquid in Fireclay? What is the use of temperature in isostatic pressing? Why is firing required in clay based ceramic manufacturing? What is the type of fracture in ceramics? | 7+2+
4+6+
4+2 |
| 5 | Why is refractory metal having body centered cubic crystal structure? What is the method to improve fracture toughness in ceramic matrix composites? Why is aging preferred in high temperature alloys? What is the strain hardening process of α (alpha) Titanium alloys? | 4+8+
8+5 |
| 6 | What are the amounts of Carbon, Tungsten, Chromium, Vanadium and Molybdenum in high speed steel? What are the hardening and tempering treatments of high speed steel? What are reasons for red hardness in high speed steel? Why is untransformed austenite not suitable in the microstructure of high speed steel? | 5+10
+5+5 |