

B.E. METALLURGICAL ENGINEERING THIRD YEAR SECOND SEMESTER EXAM 2025**SUBJECT: SOLID STATE PHASE TRANSFORMATION PROCESSES****Time: 3 hours****Full Marks: 100****Answer any four (4) questions.**

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| 1 | What are the influences of current frequency, magnetic permeability and electrical resistivity on the change of microstructures of the steel during induction hardening? What are the requirements of tempering after induction hardening? What is auto tempering in low carbon steel? What is the difference between hardness and hardenability of steel? | 10+6+5+4 |
| 2 | What is gas carburizing? What is pack carburizing? What are the methods to remove retained austenite after carburizing of the steel? What could be the temperatures of applications of carburized steels? | 8+8+6+3 |
| 3 | What is nitriding? Why is nitriding of steel performed in ferrite? What are the reasons for no heat treatments after nitriding of steels? | 10+8+7 |
| 4 | What are the effects of carbon content in steels on the hardness of retained austenite during quenching? What are consequences of cooling rate during heat treatments on the microstructures of plain carbon steel holding 0.1 wt% Carbon? What are the thermal stress and phase transformation stress during heat treatments of steel? | 5+10+5+5 |
| 5 | What is habit plane? What are the explanations for the presence of dislocations, twins and microcracks in the microstructure of martensite in high carbon steel? What are the different stages of tempering? What is Holloman-Jaffe parameter? What are the uses of Holloman-Jaffe parameter? | 4+8+10+1
+2 |
| 6 | What are the reasons for lower transformation temperatures of bainite in steel than pearlite? What are the grounds for darker appearances of the microstructure of lower bainitic steel? What is Grossman hardenability test? What are the sources for increase in hardness after tempering of the steel containing 0.1 wt% Carbon, 9 wt% Chromium and 1 wt% Molybdenum? | 7+3+8+7 |