Ref. No.: Ex/Met/PC/B/T/322/2024

B.E. METALLURGICAL ENGINEERING THIRD YEAR SECOND SEMESTER EXAM 2024

SUBJECT: SOLID STATE PHASE TRANSFORMATION PROCESSES

Time: 3 hours **Full Marks: 100**

Answer any four (4) questions.

1	What are the alloying elements present in precipitation hardened austenitic stainless steel? What are the heat treatments of precipitation hardened austenitic stainless steel? What are the strengthening mechanisms in ferritic and austenitic stainless steels?	5+8+12
2	What is the precipitate free zone in austenitic stainless steel? Why does precipitate free zone develop in austenitic stainless steel? What are the processes for exclusion of the precipitate free zone in austenitic stainless steel?	5+8+12
3	Why does sigma phase form in austenitic stainless steel? What are the reasons to achieve high fracture toughness in maraging steel? Why are high carbon and tungsten used in high speed steel?	8+9+8
4	What are the heat treatments of high speed steel? What is the microstructure of the high speed steel after heat treatments? Why does high speed steel undergo brittle fracture? What are the causes for high wear resistance of high speed steel?	12+4+6+3
5	Why do pearlite start and finish temperatures of a plain carbon steel change with time but martensite start and finish temperatures do not change? What are the reasons for development of alternate lamella of ferrite and cementite in pearlite in a steel but lath or plate in martensite in a steel?	12+13
6	What is ausforming? What is the thermomechanical treatment to produce ferrite and spherical cementite in the microstructure of a steel? What is zerolling?	7+11+7