

**B.E. METALLURGICAL ENGINEERING THIRD YEAR FIRST SEMESTER
SUPPLEMENTARY EXAM 2024**

Time: 3 hours

PHYSICAL METALLURGY

Full Marks: 100

Answer any four (4) questions.

1. What is diffusion? What is the dependence of diffusion on time and temperature? What are the mechanisms of diffusion? 4+14+7
2. What is concentration? What are the effects of concentration gradient on diffusion? What are the different types of supercooling during solidification? 2+14+9
3. What are the different regions of the microstructures in the cast ingot? In what way are these regions formed? What are the macro and micro segregation? 6+12+7
4. Draw iron cementite phase diagram. What are the invariant reactions in iron cementite phase diagram? Calculate the amount of phases in 0.25 wt% plain Carbon steel and 1.5 wt% plain Carbon steel at room temperature. 5+12+8
5. What are the advantages of having approximately 4.4 wt% Carbon in the hot metal? What are the differences in the chemical composition, microstructures and the phases of the grey cast iron and white cast iron? What are the effects of cooling rate on controlling the microstructures of the grey and white cast iron? 8+11+6
6. What is the temperature of recrystallization of 0.1 wt% plain Carbon steel? What are the phases present at the temperature of recrystallization in 0.1 wt% plain Carbon steel? What are the influences of the chemical composition of the phases and the microstructure of the 0.1 wt% plain Carbon steel on recrystallization? 8+4+6+7