Type: DES

Q1. Calculate the Atomic packing factor for Body centered cubic crystal Structure. (5)

Q2. List the 7 types of crystal systems and 14 Bravais lattices based on lattice parameters. (3)

Q3. Define i) Unit cell ii) Space Lattice iii) Co-ordination number and iv) Atomic Packing factor (2)

Q4. Draw the Iron-Carbon equilibrium diagram with all the important temperatures and phases involved also describe the 3 important invariant reactions involved. (4)

Q5. List different imperfections found in crystals. Elaborate 1-Dimensional crystal defects. (3)

Q6. Cite different Strengthening Mechanisms. Describe Strain hardening mechanism with schematic illustration in terms of stress-strain diagram? (3)

Q7.Illustrate the microstructure evolution in Cu-Ni Isomorphous system during solidification.(4)

Q8. Explain 3 stages of creep through creep curve (3)

Q9. List and explain the different factors in Hume-Rothery Rules (3)

Q10. Explain the age hardening phenomenon and microstructure evolution in non-ferrous alloy with the help of TTT-Diagram. (3)

Q11. Lead (Pb) melts at 323^{o} C and Tin (Sn) melts at 232 ^{o}C. Addition of Sn to Pb lowers the melting-point of Pb and addition of Pb to Sn also lowers the melting point of Sn. At 180 ^{o}C, liquid of composition 61.9% Sn, Alpha (α) phase of composition 19.2% Sn and beta (β) phase of composition 96.2% Sn are in thermal equilibrium. The solubilities of Pb in Sn and Sn in Pb at room temperature is negligible. solubilities of Pb in Sn and Sn in Pb at room temperature is negligible.

(i) Draw the Pb-Sn phase diagram

(ii) Identify the reaction occurring at 180 ^{o}C

(iii) Calculate the amount of phases in an alloy of composition 40% Sn at 179 ^{o}C (4)

Q12. Describe the effect of the following alloying elements on the mechanical properties of Aluminium. (a) Copper (b) Zinc (c) Manganese (d) Silicon (e) Magnesium (f) Magnesium and Silicon (3)

Q13. With a schematic representation write a note on Electrochemical machining, Also, explain the dependence of different process parameters on Electrochemical machining. (4)

Q14. Explain fused deposition modelling with a neat diagram. (3)

Q15. Explain vacuum bag moulding process for manufacturing of polymer matrix composites with a neat diagram. (3)