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C20-MET–304

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BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2023

DMET - THIRD SEMESTER EXAMINATION

PHYSICAL METALLURGY

Time : 3 Hours] [*Total Marks* : 80

PART—A 3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. Define space lattice and unit cell.

2. State Fick's 1st law of diffusion with equation.

3. Draw the cooling curve for a pure metal and alloy.

4. Define liquidus and solidus line.

5. Define eutectoid reaction.

6. State the differences between cast iron and steel.

7. List out the different types of brasses.

8. State the composition of high tensile brass.

9. State the importance of microscopic and macroscopic examination.

10. State the principle of X-ray diffraction.

PART—B

8×5=40

Instructions : (1) Answer **all** questions.

(2) Each question carries **eight** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* Calculate the packing factor for FCC.

(OR)

(b) Calculate the packing factor for HCP.

12. *(a)* Explain the cooling of an alloy in isomorphous system by showing the microstructure of various points during solidification.

(OR)

(b) Draw the equilibrium diagram of eutectic system and explain the solidification process of eutectic alloy.

13. *(a)* Explain the phase transformations during slow cooling for eutectoid steels with the help of microstructures.

(OR)

(b) Draw the equilibrium diagram of Fe-Fe3C to scale and label various phases in it.

14. *(a)* Draw lead antimony equilibrium diagram. Write the composition properties and applications of babbitts.

(OR)

(b) Draw the Al-Si equilibrium diagram and indicate the various phases. Explain the modification treatment of aluminium-silicon eutectic structure.

15. *(a)* Explain the working principle of metallurgical microscope with the help of a line diagram.

(OR)

(b) Explain the etching mechanism. List the etchants for important ferrous and non-ferrous metals and alloys.

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) The question carries **ten** marks.

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. How substitutional solid solutions form by Hume-Rothery rules?

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