Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

RAU4G001/RCl4G001/RME4C003

4th Semester Regular / Back Examination: 2022-23

SUBJECT: Introduction to Physical Metallurgy and Engineering Material

BRANCH(S): AUTO, C&EE,CIVIL, MMEAM,MECH

Time : 3 Hour

Max Marks : 100

Q.Code : M607

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Differentiate between metals and ceramics (two properties).

b) Find the atomic packing factor of a BCC unit cell.

c) Show [111] and (100) in a simple cubic unit cell.

d) Differentiate between interstitial and substitutional solid solutions.

e) Draw and label an isomorphous system.

f) Differentiate between T-T-T and C-C-T diagram.

g) What do you mean by a composite? Give an example.

h) What the two major types are of voids in common crystal structures?

i) What do you mean by recrystallization?

j) What is temperature and carbon % at the eutectic point of the Fe-Fe_3C diagram?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) What is a phase? State Gibb's phase rule for metals and alloys. Find out the degrees of freedom at peritectic, eutectic and eutectoid point of Fe-Fe_3C diagram.

b) Compare the characteristics of voids in iron-carbon system with necessary sketches.

c) Show that the c/a ratio of HCP unit cell is 1.633.

d) Explain yield point phenomena in mild steel.

e) Explain Lever rule and its application taking the example of an isomorphous system.

f) Explain the factors governing solids solubility.

g) Differentiate: hardening vs. tempering.

h) Explain the factors affecting hardenability.

i) Write short note on “Cermets”.

j) Draw the cooling curve of pure iron explaining its allotropic changes.

k) Compare SC, BCC and FCC systems with suitable diagrams.

l) Compare and contrast between steel and cast iron.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Describe the different characteristics of primary bonds with suitable diagrams. **(16)**

Q4 Draw a neat sketch of Iron-cementite phase diagram. Show different phase fields. Explain different invariant reactions taking place in the system. **(16)**

Q5 What do you mean by Metal matrix composites? Describe one manufacturing procedure for fiber reinforced composite. **(16)**

Q6 What are "Optical fibres"? Explain the principle, structure, application of optical fibres. **(16)**