Ref. No. **Ex/PROD/PC/B/T/221/2024**

B.E. PRODUCTION ENGINEERING 2nd YEAR 2nd Semester EXAMINATION, 2024
SUBJECT: MATERIAL SCIENCE AND TECNOLOGY

Time: Three hours **Full Marks 100**

ANSWER ALL QUESTION

(*Answer briefly. Irrelevant discussion will be penalised.*
Draw the sketches neatly and label them properly)

1. a) Draw a [6 2 $\bar{4}$] direction in a base centered orthorhombic lattice or base centered monoclinic lattice. **3**

   b) Discuss about the different types of point imperfections with suitable sketches. **5**

   c) Describe relation between bonding forces and bonding energy with inter-atomic separation with suitable figure. **4**

   d) Metal X has an atomic radius of 1.28Å, and an atomic weight of 63.5g/mol. Compute its Density. **4**

   e) Compute planar density of (110) plane for Silver (Ag) **OR** Nickel (Ni). **4**

(CO1)

2. a) Explain the Creep and Anelasticity phenomenon of metal. **5+3**

   b) Explain proof stress, proportional limit, yield strength, ultimate tensile strength and fracture point with the help of stress-strain diagram. **5**

   c) Discuss the application of different non-destructive testing techniques on welding joints. **2**

   d) Describe advantage and disadvantages of Ultra sonic Non-Destructive Testing of materials. **5**

   OR

   Describe advantage and disadvantages of Eddy Current Non-Destructive Testing of materials.

(CO2)

3. a) Differentiate between Homogeneous and Heterogeneous nucleation **5**

   b) What do you mean by Phase? State and explain the Gibb's phase rule. **2**

   OR

   Explain eutectic point with the help of ice-sodium cloride phase equilibrium diagram.

   c) Draw the iron-carbon equilibrium diagram and properly label the phase name, temperature, percentage of carbon, eutectic, eutectoid, peritectic point, hyper and hypo eutectic and eutectoid zone, commercial cast iron and different steel range etc. **13**

(CO3)

4. a) Draw and label the T-T-T diagram for carbon steel with 0.8% carbon form kinetic curve. **5**

   b) Differentiate between Normalising and Full Annealing of carbon steel. **5**

[Turn over

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c) Explain the merit and demerits of nitriding process. **3**
OR
Discuss briefly the Induction flame hardening process.

d) Describe advantage and disadvantages of Induction Furnace using for steel making process. **4**

e) Explain briefly the role of oxygen lance in LD process for steel making. **3**
(CO4)

5. a) Write short notes on: (**any one**) **3**
I. Babbitt Metal;
II. PMMA

b) Differentiate between Thermoplasts and Thermoset polymer. **4**

c) Describe briefly three different biodegradable plastics with their uses. **6**

d) Explain briefly the sintering process with suitable figure/s. **3**

e) Write short notes on(**any one**): **4**
(i) Malleable Cast Iron.
(ii) CMC
(CO5)