|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Roll No. |  |  |  |  |  |  |  |  |  |  |  |  |

****

**Presidency University**

**Bengaluru**

**SCHOOL OF ENGINEERING**

**SUMMER TERM END TERM EXAMINATION AUGUST 2024**

|  |  |
| --- | --- |
| Semester : Summer Term | Date : 05-08-2024 |
| Course Code : MEC2016 | Time : 1:00 PM to 4:00 PM |
| Course Name : Material Science and Metallurgy | Max Marks :100 |
| Program : B.Tech | Weightage :50% |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PART A** | | | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 2M=10M** | | | | | |
| 1 | Write properties of metallic bonds | | (CO 1) | | [Knowledge] |
|  | | | | | |
| 2 | Name common types of point imperfections. | | (CO 2) | | [Knowledge] |
|  | | | | | | Name common types of point imperfections. | |
| 3 | Define solid solutions. | | (CO 2) | | [Knowledge] |
|  | | | | | |
| 4 | Name 2 line imperfections. | | (CO 2) | | [Knowledge] |
|  | | | | | |
| 5 | Name 4 elements having BCC crystal structure. | | (CO 2) | | [Knowledge] |
|  |  | |  | |  |
| 6 | Define interstitial solid solution. | | CO 2) | | [Knowledge] |
|  |  | |  | |  |
| 7 | What is a vacancy in crystal structures? | | CO 2) | | [Knowledge] |
| **PART B** | | | | | |
| **ANSWER ANY 6 QUESTIONS 6Q X 5M=30M** | | | | | |
| 8 | Explain how hypereutectoid steel transforms from liquid phase to solid phase. Draw microstructure for at least 4 points every step. | (CO 3) | | [Comprehension] | |
|  | | | | | |
| 9 | A 40 wt.% Sn-60 wt.% Pb alloy is at 200°C. Find   1. Phases present 2. Compositions of phases 3. The relative amount of each phase. | (CO 3) | | [Comprehension] | |
|  | | | | | |
| 10 | Explain microstructure evolution during cooling of Cu-Ni alloy | (CO 4) | | [Comprehension] | |
|  | | | | | | Explain microstructure evolution during cooling of Cu-Ni alloy. |
| 11 | What is a solid solution? Mention the Hume-Rothery rule applicable to substitutional solid solution. | (CO 4) | | [Comprehension] | |
|  | | | | | |
| 12 | Describe briefly BCC, FCC and HCP crystal systems considering the number of atoms, packing efficiency and coordination number. | (CO 4) | | [Comprehension] | |
|  | | | | | |
| 13 | What is stainless steel? Write the difference between austenitic and ferritic steel. | (CO 4) | | [Comprehension] | |
|  |  |  | |  | |
| 14 | What is the purpose of tempering a quenched steel? How can the tempered properties be optimized? Discuss with examples. | (CO 3) | | [Comprehension] | |
|  |  |  | |  | |
| 15 | What is dual-phase steel? Write 5 advantages of dual-phase steel over low-carbon steel. | (CO 3) | | [Comprehension] | |
|  | | | | | |
| **PART C** | | | | | |
| **ANSWER ANY 3 QUESTIONS 3Q X 20M=60M** | | | | | |
| 16 | Draw a Cu-Ag eutectic phase diagram. Mark all the phases. Explain how hypo eutectoid alloy will transform from liquid to solid phase using microstructure. | | (CO 3) | | [Analysis] |
|  | | | | | |
| 17 | Classify all seven crystal systems, and mention relation in a,b,c and, α, β, γ. Draw figures for each classification. | | (CO 4) | | [Comprehension] |
|  | | | | | |
| 18 | Explain Austenite, Ferrite, pearlite and cementite in terms of their composition | | (CO 4) | | [Comprehension] |
|  | | | | | |
| 19 | Draw a Fe-FeC3 phase diagram (Temperature vs composition). Label all the phases and mark invariant points. | | (CO 3) | | [Comprehension] |
|  | | | | | |