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Jaypee Institute of [illegible] Technology, Noida
Test-1, Examination, Odd 2022
B.Tech V Semester

Course Title : ENGINEERING MATERIALS AND TECHNOLOGY **Maximum Time : 1 Hr**
Course Code : 22B12PH311 **Maximum Marks : 20**

Course Outcomes:
After completion of the course, students will be able to:
CO1: Recall the importance of engineering materials existing in the environment around us.
CO2: Explain and compare the different properties of the materials along with their broad classifications.
CO3: Apply the knowledge to analyze and use the different processes of the materials manufacturing.
CO4: Apply the knowledge to develop/choose materials for different engineering applications including robotic/drone and aerospace.

Note: Attempt all questions. Use of Basic Scientific calculator is allowed.

***Question 1. CO1:* 3 x 4 = 12 Marks**

A) *Define Engineering Materials* ? What are the main classes of Engineering Materials. Elaborate with examples ?

B) *Describe and illustrate line defects* with schematic. How is Burgers Vector different in them ?

C) Distinguish between equiaxed and columnar grains in a solidified metal structure along with a figure ?

D) The ASTM grain size number **n** is defined by $N = 2^{n-1}$, where **N** is the number of grains per square inch on a polished and etched material surface at a magnification of 100 X. Determine the ASTM grain size number of a metal specimen if **45** grains per square inch are measured at a magnification of 100 X ?

Question 2. CO2: 2 x 4 = 8 Marks

A) (i) The concentration of hydrogen gas across a **2 mm** thick palladium sheet differs by **4 kg/m^3**. Calculate the diffusion flux of hydrogen in SI units considering steady state diffusion with diffusion coefficient **10^{-10} m^2/s** ?

(ii) Compare and differentiate interstitial and vacancy atomic mechanisms of diffusion ?

B) (i) Broadly classify the different magnetism in Engineering Materials. Show Diamagnetism and Paramagnetism on **M** vs **H** as well as χ vs t plots ?

(ii) Write about the history of development of materials with a proper diagram (flow-chart / ray-diagram) with reference to India? In your own opinion, what role India can play in the new generation Engineering Materials using data science tools of AI/ML ?

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