PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST – 1

Semester & AY: Even Sem 2021-22   **Date**: 27.04.2022

Course Code   : PET-409   **Time**: 10:00 AM to 11:00 AM

Course Name: Material Science Engineering   **Max Marks**: 30

Program & Sem : B.Tech (Petroleum Engineering) & VI   **Weightage**: 15%

Instructions:
  (i) ***Read the question carefully and answer all the questions***
  (ii) ***Scientific calculator is allowed***

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries 2 marks   **(5Qx2M=10)**

Q.NO.1. What are the different types of cubic cell unit?   (C.O.NO 1) [Knowledge]

Q.NO.2. Differentiate between ductile and brittle material.   (C.O.NO 1) [Knowledge]

Q.NO.3. What do you mean by stiffness of material?   (C.O.NO 1) [Knowledge]

Q.NO.4. Establishment and publication of these standards are often coordinated by professional societies to produce effcient materials. The most common standard to implement is_____.

a) API   b) ASI   c) ASTM   d) ACI   (C.O.NO 1) [Knowledge]

Q.NO.5. Poison's ratio is the relation between _____ and _____.   (C.O.NO 1) [Knowledge]

Part B [Thought Provoking Questions]

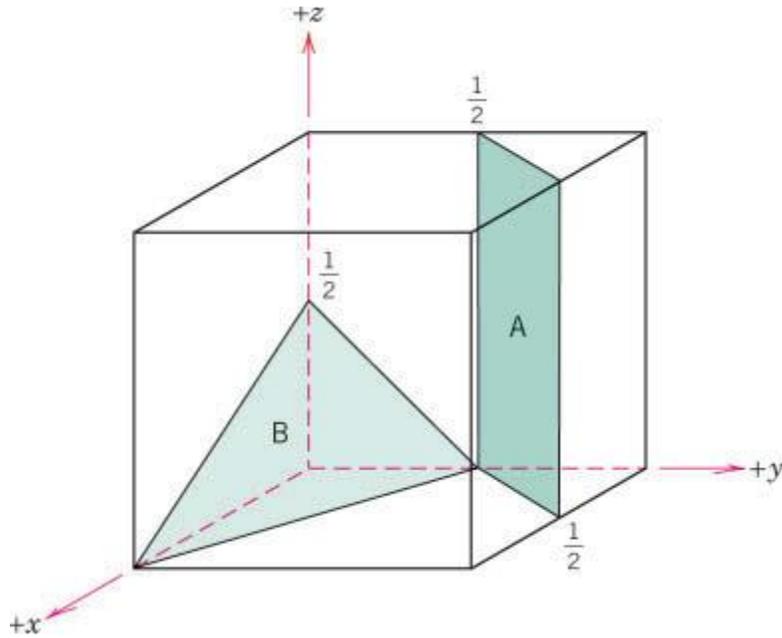**Answer the Question. Question carries 10 marks.**   **(1Qx10M=10)**

Q.NO.6. Atomic packing factor (APF), packing efficiency, or packing fraction is the fraction of volume in a crystal structure that is occupied by constituent particles. How can you find the APF for BCC, FCC and simple cubic structure?   (C.O.NO 1) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. Question carries 10 marks.   **(1Qx10M=10)**

Q.NO.7. Miller indices are used to specify directions and planes. These directions and planes could be in lattices or in crystals. The number of indices will match with the dimension of the lattice or the crystal. In the given figure, 2 planes are shown as A and B. How you can find the Miller indices for the given Planes?

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TEST – 2

Semester & AY: Even Sem 2021-22   **Date**: 02.06.2022

Course Code : PET-409   **Time**: 10:00 AM to 11:00 AM

Course Name: Material Science and Engineering (OE-II)   **Max Marks**: 30

Program & Sem : B.Tech (PET) & VI   **Weightage**: 15%

Instructions:
- *(i)   Read the question carefully and answer all the questions*
- *(ii)   Scientific calculator is allowed*

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries TWO marks   (5Qx2M=10M)
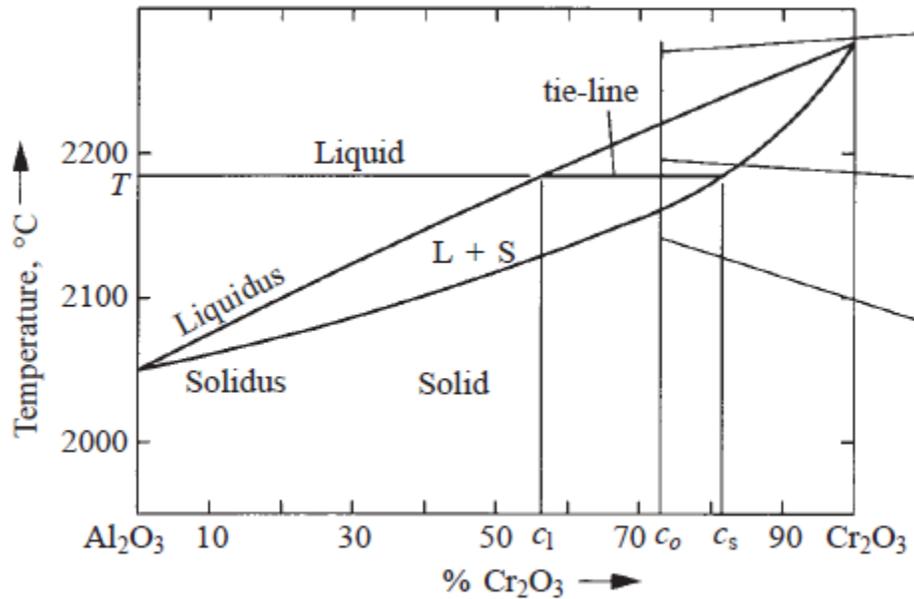
1.What do you mean by degree of freedom of any system?   (C.O.NO 3) [Knowledge]

2. What is Peritectic reaction?   (C.O.NO 3) [Knowledge]

3. Triple point of water is ------ degree C at ---------- atm pressure.   (C.O.NO 3) [Knowledge]

4. Differentiate between pseudoplastic and dilatant fluid   (C.O.NO 2) [Knowledge]

5.Give example of Rheopactic fluid and dilatant fluid.   (C.O.NO 2) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Question carries SIX marks.   (2Qx6M=12 M)

Q.NO.6. Tie line method is used to find the liquid and solid composition for binary system. Following figure shows the binary phase diagram for Al_2O_3 and Cr_2O_3. Determine the liquid, solid and average composition of Al_2O_3 and Cr_2O_3 at C_l, C_s and C_0, respectively.   (C.O.NO 3) [Comprehension]

7. Polymer solutions are generally considered as non-Newtonian fluid. Stress vs strain and Viscosity vs time diagram can be used to explain the different types polymer solutions based on time and viscosity. Explain the different types of non-Newtonian behavior of polymer solution using stress vs strain and viscosity vs time diagram.   (C.O.NO 2) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question.The Question carries EIGHT marks   **(1Qx8M=8 M)**

8 A tensile specimen with a 12 mm initial diameter and 50 mm gauge length reaches maximum load at 90 kN and fracture at 70 kN. The minimum diameter of fracture is 10 mm. Engineering stress and strain are not similar to linear stress and strain. From the given values, determine the engineering stress at maximum load and true fracture stress. Also find the deviation of engineering strain and linear strain.   (C.O.NO 2) [Comprehension]

PRESIDENCY UNIVERSITY
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SCHOOL OF ENGINEERING

END TERM EXAMINATION

Winter Semester: 2021-22   **Date**: 1ˢᵗ July 2022

Course Code : PET409   **Time**: 09:30 AM to 12:30 PM

Course Name: Material Science and Engineering (OE-II)   **Max Marks**: 100

Program & Sem : B.Tech (Petroleum Engineering) & VI   **Weightage**: 50%

Instructions:
  (i)   ***Read the question carefully and answer all the questions***
  (ii)   ***Scientific calculator is allowed***

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries FIVE marks **(5Qx5M=25 M)**

Q.NO.1.Fill in the blanks   (C.O.NO 1) [Knowledge]

a. Stress required during plastic deformation is _____than that required during elastic deformation.

b. In body centered cubic structure the center atom is shared by ————adjacent unit cells.

c. In simple cubic crystal structure, the average number of atoms per unit cell is _____

d. BCC structure have _____ Average no. of atoms per unit cell

e. Circular brackets symbolically represents crystallographic _____

Q.NO.2 Select the correct options for the following   (C.O.NO 1) [Knowledge]

a. Indexing or designation in a unit cell can be done for a particular

A. point location   B. direction

C. plane   D. all of the above

b. A non-crystalline material is characterized as having _____

A. repetitive arrangement of atoms in all direction   B. repetitive arrangement of atoms in any one direction

C. non- repetitative arrangement of atoms in all three directions   D. none of the above

c. A higher value of average number of atoms per unit cell indicates

A. bigger size of materials

B. higher density of materials

C. lower density of materials

D. none of the above

d. A material having repetitive arrangement of atoms over larger atomic distances is

called

A. crystalline material

B. non- crystalline material

C. solid material

D. liquid material

e. _____is defined as fraction of volume occupied by atoms in unit cell

A. ligancy number

B. average number of atoms per unit cell

C. atomic packing factor

D. none of the above

Q.NO.3 Match the following   (C.O.NO 2) [Knowledge]

A. Conductivity	1. Resistance of a material to localized plastic deformation
B. Ductility	2. Ability to conduct electricity and heat
C. Brittleness	3. Ability of material to absorb a certain amount of energy without failure
D. Hardness	4. A little tendency to deform before rupture
E. Toughness	5. Ability of material to drawn into wire

Q.NO.4 Define the following with example   (C.O.NO 2) [Knowledge]

a. Elastic material

B. Plastic material

Q.NO.5 What do you mean by Geometric and Magnetic length? Why magnetic length is always

less than geometric length. What is the relation between these lengths?   (C.O.NO 4) [Knowledge]
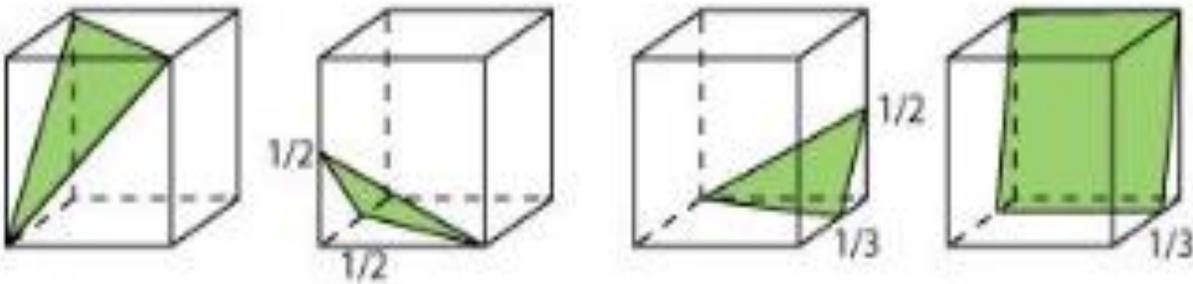
Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries 12 marks.   (3Qx12M=36 M)

Q.NO.6. Miller indices are used to specify directions and planes. These directions and planes could be in lattices or in crystals. The number of indices will match with the dimension of the lattice or the crystal. In the given figure, 4 planes are shown. How you can find the Miller indices for the given planes?

(C.O.NO 2) [Comprehension]

Q.NO.7. A unit cell is the smallest portion of a crystal lattice that shows the three-dimensional pattern of the entire crystal. The properties of metal depends on the number of atoms per unit cell. How can you find the effective atoms per unit cell for BCC, FCC, HCP and Simple cubic unit cell? If the edge length of a cubic cell is "a" and the radius of atoms is "R", find the relation between "a" and "R" for BCC and FCC structure.   (C.O.NO 2) [Comprehension]

Q.NO.8. Classify the metals based on their magnetic properties with example. What do you mean by magnetic flux density and magnetic field intensity? Explain the magnetic hysteresis with the help of hysteresis loop.   (C.O.NO 4) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. Each Question carries 13 marks.   **(3Qx13M=39 M)**

Q.NO.9 Define Poison's ratio for isotropic and anisotropic material. Find the relation between poison's ratio, young's modulus and shear modulus. A tensile stress is to be applied along the long axis of a cylindrical brass rod that has a diameter of 15 mm. How you can change the diameter of the rod by 3×10^{-3} mm? If the deformation is entirely elastic. Poison's ratio for brass is 0.34 and Young's modulus is 100 GPa   (C.O.NO 2) [Application]

Q.NO.10
a. Let the magnetic moment of a bar magnet is P_m whose magnetic length is d=2l and pole strength is q_m. Compute the magnetic moment of the bar magnet when it is cut into equal three pieces
i. Along the length of the magnet
ii. Along the perpendicular to its length
b. The repulsive force between two magnetic poles in air is 12×10^{-3} N. If the two poles are equal in strength and separated by a distance of 20 cm. Which law will you use to determine the pole strength of each pole also find the pole strength. The value of magnetic permeability K is 10^{-7} Hm^{-1}.
                    (C.O.NO 4) [Application]

Q.NO.11 Structure of metal with respect to temperature can be studied by phase diagram. Draw the phase diagram for iron- carbon and explain the different structures with respect to composition and temperature. Show the eutectic, eutectoid and peritectic reactions and find the degree of freedom for these points.   (C.O.NO 3) [Application]