

Notes: 20 marks for each question

Q1/ A. Answer (any ten) of the following:

1. Compare by sketch between metallic, and ionic bonds.
2. List the sources of dislocations.
3. Sketch the relation between temp. and Tg.
4. Prove that the A.P.F for HCP=0.74
5. List the types of defects in materials.
6. Sketch and name the two types of fracture
7. What is the effect of pigments and black carbon addition for polymers.
8. Name the bands of energy gap with sketch.
9. What is the difference between n-type, p-type semiconductors.
10. Define the green engineering.
11. Name the stages of fatigue failures with sketch.

Q1/ B. Epoxy-glass composite with volume fraction of fibers of 65% and modulus of elasticity of epoxy is 3.5 GPa and 70 GPa for glass fiber. Calculate the modulus of elasticity when load is applied at:

- a. Zero degree for fiber.
- b. Right angle (90°) for fiber

Q2/ A. Complete (any ten) of the following sentences:

1. Dislocations movement can be hindered by
2. E% for thermosets equal to but for cast iron equal to
3. Ferromagnetic materials have permeability of as
4. Covalent bond is very strong because
5. Composite can be classified to
6. Adhesive wear is where corrosion wear is
7. Diamagnetic materials have permeability of as
8. Planar defects can be classified to
9. Permeability of diamagnetic material equal to as
10. Bond strength is proportional with atomic number
11. Portland cement is a mixture of

Q2/ B. What is the mobility of holes in (Si) that has been doped with boron if there are 10^{21} Boron atoms in cubic meter, the charge carried by holes is 1.6×10^{-19} , the conductivity of (Si) at 300 K is 7.7 S/m

Q2/ C. Calculate the stress (in pascal) at which the glass rod might be expected to fracture if it has an internal flaw of (11 μm) at right angle (90°) to stress.

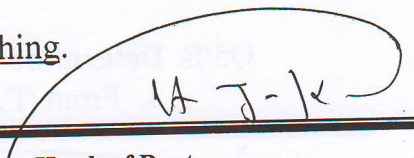
The glass has (E) of 70 GPa and surface energy of 0.3 J/ m²

Q3/ A. Correct under line any (ten) of the following:

1. Medium carbon steel has (0.15-0.4)% C.
2. Increasing of hardness requires slow cooling during quenching.
3. (Cr+Ni) are added to steel to increase grain size.


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