



Continuous Assessment Test -2
Winter Semester (2023-24)

Programme Name & Branch : B.Tech
Course Code : BCHE206L
Course Name : Material Science and Engineering
Faculty Name(s) : Shankar Raman Dhanushkodi
Class Number(s) : VL2023240501190
Slot : C2+TC2
Date of the Exam : 03/04/2024 09:30 AM
Exam Duration : 90 minutes

Maximum Marks: 50

General instruction(s): Answer all Questions

Q.No.	Question	Max Marks
1	Consider 1 kg of an aluminum-casting alloy with 10wt % silicon. (a) Upon cooling, at what temperature would the first solid appear? (b) What is the first solid phase, and what is its composition? (c) At what temperature will the alloy completely solidify? (d) How much pro-eutectic phase will be found in the microstructure? (e) How is the silicon distributed in the microstructure at 576°C?	10
2	The following data are collected in a flexural test of a nylon to be used in the fabrication of lightweight gears: Test piece geometry: 7 mm x 13 mm x 100 mm, Distance between supports = L = 45 mm, Initial slope of load of deflection curve = 404 x 10³ N/m. Calculate the flexural modulus for this engineering polymer.	10

3.	An aluminum rod is to withstand an applied force of 50,000 pounds. To assure sufficient safety, the maximum allowable stress on the rod is limited to 20,000 psi. The rod must be at least 125 in. long but must deform elastically no more than 0.25 in. when the force is applied. Design an appropriate rod.	10
4.	Consider a parallel-plate capacitor having an area of $5.45 \times 10^{-4} \text{ m}^2$ and a plate separation of $20 \times 10^{-3} \text{ m}$ (0.08 in.) across which a potential of 10 V is applied. If a material having a dielectric constant of 6.0 is positioned within the region between the plates, $\epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}$ compute the following: (a) Capacitance (b) Magnitude of the charge stored on each plate (c) Dielectric displacement D (d) Polarization	10
5.	(a) Visible light having a wavelength of $12 \times 10^{-7} \text{ m}$ appears orange. Compute the frequency and energy of a photon of this light (b) How do you compute Hall voltage and magnetic field of a metal	10