



ATTEMPT ALL QUESTIONS

Q1

(13 mark)

- 1-a) The velocity of a particle depends upon time t , according to the equation $v = a + bt + (c/t)$. Write the dimensions of a , b , and c . (3 marks)
- (b) Discuss the following: (i) international system of units, (ii) safety factor, (iii) simple harmonic oscillation, (iv) standing waves, (v) intensity level of sound. (10 Marks)

Q2

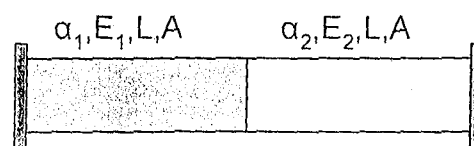
(12 mark)

- 2-a) Two overlapping waves travel in opposite directions, each with a speed of 40 cm/s. they have the same amplitude of 5 cm and frequency of 10Hz (i) Write the wave function for the resulting standing wave, (ii) What is the distance between adjacent nodes? (4 Marks)
- (b) A speaker emits 0.314 W of acoustic power. Assume that it behaves as a point source which emits uniformly in all directions. At what distance will the intensity level be 90 dB. (4 Marks)
- (c) A car is moving at 40 m/s along a straight road, surrounding its 600 Hz horn. You are standing at the side of the road. What frequency do you hear as the car is approaching you (speed of sound in air is 340 m/s). (4 Marks)

Q3

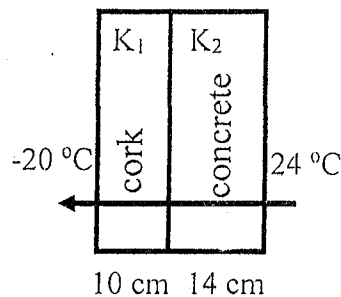
(13 mark)

- 3(a) Give short notes about the three principal methods of heat transfer, Discuss the analogy between heat conduction and Electrical Systems (5 Marks)
- (b) The resistance of a platinum resistance thermometer is $9\ \Omega$ at $32\ ^\circ\text{F}$ and $12\ \Omega$ at $212\ ^\circ\text{F}$. What will be its resistance when it placed in liquid nitrogen at $-200\ ^\circ\text{C}$? (4 Marks)
- (c) Two rods of the same cross-sections and made of different materials, are placed between massive walls as shown in figure. The rods are heated by ΔT degree. Find the force with which the rods act on each other. (disregards the deformation of the walls, the rods have). (4 Marks)



- 4(a) What quantity of heat is required to change 20 g of ice at 32°F to steam at 212°F?
 ($c_{\text{ice}} = 0.5 \text{ cal/g} \cdot ^\circ\text{C}$, $c_{\text{water}} = 1 \text{ cal/g} \cdot ^\circ\text{C}$, $L_f = 80 \text{ cal/g}$ and $L_v = 540 \text{ cal/g}$). (4 Marks)
- (b) At what rate is the energy radiated by a sphere of radius 5 cm at 1000 K and with an emissivity of 0.3 (Stefan's constant = $6 \times 10^{-8} \text{ W/m}^2 \text{ K}^4$). (4 Marks)
- (c) The wall of a freezing plant is composed of 10 cm of corkboard inside 14 cm of solid concrete. (a) If the temperature of the inner wall of the corkboard is -20°C and that of the outer wall is 24°C , find the temperature of the corkboard-concrete interface. (b) Calculate the heat flow in kilocalories per square meter per second.
 (Take, $K_1 = 1 \times 10^{-5} \text{ Kcal/m.s.}^\circ\text{C}$, $K_2 = 4.1 \times 10^{-4} \text{ Kcal/m.s.}^\circ\text{C}$).

(4 Marks)



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Good luck

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Prof. Abed Nasr

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