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University Examinations 2013/2014

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN HORTICULTURE/ BACHELOR OF SCIENCE IN FOOD SCIENCE AND TECHNOLOGY/ BACHELOR OF SCIENCE IN FOOD SCIENCE AND NUTRITION

SPH 2160: PHYSICS I

DATE: DECEMBER 2013 **TIME: 2HOURS**

INSTRUCTIONS: *Answer questions **one** and any other **two** questions*

QUESTION ONE - (30 MARKS)

a) Differentiate between displacement and distance. (2 Marks)
b) A car of mass 720kg moving at 20m/s is brought to rest by applying brakes so that it decelerates uniformly. If the car travels a distance of 40m before coming to rest, calculate the force exerted by the car brakes. (5 Marks)
c) A stone whirled vertically in a circle of radius 2m. If the mass of the stone was 100g find the tension on the string when the stone is vertically above given that its angular velocity = 3rad/s. (4 Marks)
d) Explain why a liquid in glass thermometer is not suitable for measuring rapidly changing temperatures giving reasons for your answer. (2 Marks)
e) State the Zeroith Law of thermodynamics. (1 Mark)
f) Differentiate between specific heat capacity and molar heat capacity. (2 Marks)
g) A copper block of mass 400g is immersed in ice at $0°C$. If the initial temperature of copper block was $200°C$ and the specific latent heat of fusion of ice is 336000J/kg, determine the mass of water collected from the melting of the ice. (4 Marks)
h) A uniform bar of length 6m is supported by 2 pillars at 2m and 5m from one end. Determine the weight supported by each pillar if the mass of the bar is 72kg. (5 Marks)
i) Differentiate between radiation and convection. (2 Marks)
j) State how heat losses in a vacuum flask is prevented;
   i. Loss through conduction. (1 Mark)

ii. Loss through convection. (1 Mark)
iii. Loss through radiation. (1 Mark)

QUESTION TWO (20 MARKS)

a) A car starts from rest and attains a velocity of 20m/s in 5s. It maintains this velocity for the next 40s before it is brought to rest in 10s. Calculate
   i. Acceleration of the car from rest to maximum velocity. (2 Marks)
   ii. Average deceleration of the car. (2 Marks)
   iii. Total displacement of the car. (6 Marks)
   iv. Draw a velocity time graph for the entire motion. (3 Marks)

b) A plywheel is rotating at the rate of 3000 revolutions per second. If the plywheel has a radius of 30cm, calculate the angular velocity of a particle 15cm from the centre of the plywheel. (3 Marks)

c) A single junction thermocouple cannot be used in measurement of temperature due to emfs from other functions. Explain how this is overcome with the aid of a diagram. (4 Marks)

QUESTION THREE (20 MARKS)

a) A box lying on an inclined plane of length of plane 12m weights 120N. The box is pulled up the plane to the top of the plane. Given the angle of the plane to the horizontal is 45° and that the kinetic friction of the box and the plane is 200N. Determine total work done in moving the box. (5 Marks)

b) Show that the rate of change in momentum of a body is equal to the net force acting on the body. (4 Marks)

c) Show that for a uniform cube of length of side L_o the volume expansivity is approximately equal to the $3\propto$ where $\propto$ is the linear expansivity. (6 Marks)

d) i) State three factors that affect the conduction of heat through a conductor. (3 Marks)
   ii) Explain why it's not advisable to use a thermocouple near its neutral point. (2 Marks)

QUESTION FOUR (20 MARKS)

a) In an experiment to measure the specific heat capacity of water an electric heater rated 50Ω, 13A was used. It takes 4 minutes to raise the temperature of a given amount of water from $20°C$ to $80°C$. If the heating efficiency was 80%, determine the mass of water given that specific heat capacity of water = 4200J/kg/K. Assume the heat losses go to the calorimeter. (5 Marks)

b) Outline the steps followed in the measurement of specific heat capacity of a liquid by method of mixtures. Show all the calculations. (6 Marks)

c) A resistance thermometer has its resistance varying so that it is directly proportional to temperature. At ice point the resistance of the thermometer is 230Ω and 530Ω at steam point. Determine the temperatures when the resistance of the thermometer is 430Ω. (4 Marks)

d) An alluminium block is immersed into ice at a temperature of -10°C. The final temperature of the 2 was found to be 17°C. If the mass of ice was 120g, calculate the mass of the alluminium block given that (SPH of ice = 2100J/kg/K, SHC of water = 4200J/kg/K and S.L.H of fusion of ice = 336000J/kg. (5 Marks)
Temperature of block (initial) = 200°C
SHC of alluminium = 900J/kg/K