KIMATHI UNIVERSITY COLLEGE OF TECHNOLOGY
UNIVERSITY SUPPLEMENTARY EXAMINATION 2009/2010
YEAR ONE SUPPLEMENTARY EXAMINATIONS
FOR THE DEGREE OF BACHELOR OF SCIENCE
IN TELECOMMUNICATION AND INFORMATION ENGINEERING,
CIVIL ENGINEERING, MACHATRONIC ENGINEERING AND ELECTRICAL AND ELECTRONIC ENGINEERING

SPH 2170 PHYSICS I

INSTRUCTIONS

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

Some useful contents

1. $C = 3x10^8 m/s$
2. $g = 10m/s^2$
3. density of water $= 1g/cm^3$
4. Specific lead capacity of water $= 4200J/kgk$
5. Universal gas constant 8.314J/mol.K.
6. Boltz− man constant $= 5.6699x10^{-8}\ WM^{-2}k^{-4}$
7. Atmospheric pressure $= 101.3kpa$.

QUESTION ONE(30 MKS)

a) Define the following terms (3mks)

i.) Elasticity
ii.) Stress
iii). Angular velocity
i). Critical velocity
v). Heat capacity
vi). Refraction.

b). Using dimensional analysis find the dimension of power (2mks)
c). State four laws of dry friction (2 mks)
d) State and explain the three states of matter. (3 mks)

e). Two slits are spaced at 0.4mm apart and a screen is placed at a distance of 3M, the third bright fringe is found to be displaced 6 mm from the central fringe .Determine the wave length of the light used (3 mks)

f) A FM station has a wave length of 2Gm.Calculate its frequency (2 mks)

g)State any two eye defects (1 mk)
(h) ABi−convex lens has a focal length of 10cm .If an object is 30 cm .Calculate image position and magnification (2 mks)
(i). State the three principal rays of a bi−convex lens. (1 ½)
(j) A person wants to have a bath in water at 60° c. how much water at 95°C should he add to 20kg of water at 15°C to achieve the desired temperature. (3 mks)

(k)(i) State the laws of refraction (Mks)
(l) Calculate the velocity of light in water given that the refractive index of water is 8/6 (3 marks)
(m) State and explain two characteristics of electromagnetic waves. (2 mks)

QUESTION TWO (20 MKS)

(a) (a). State (2mks)
(b) (i) Boyle's law.
(c) (ii) Charles's laws.
(d) (b). Find the volume of one mole of any ideal gas at ''standard temperature and pressure s.t.p. (3 mks)
(e) (c) Define (3 mks)
(f) (i.) Isobaric process
(g) (ii). Isothermic process
(h) (iii). Isochors process
(i)
(j) (d). The volume of an oxygen tank is 80 liters .As oxygen is withdrawn from the tank, the reading of the pressure gauge drops from 4500 Kpa. to 345Kpa. and the temperature of the gas in the tank drops from 66°c to 16°c.
(k) Calculate
(l) (i). The mass in kg of oxygen in the tank at the initial point (3 mks)
(m)(ii). The mass in kilograms of the oxygen withdrawn (3 mks)
(n) (iii). The volume that would be occupied by the oxygen withdrawn from the tank at the pressure of $1.013x10^5$ pascals and temperature of $40^{\circ}c$ (3 mks)
(o) (c.) State six basic quantities together with their SI units (3 mks)

QUESTION THREE(20 MKS)

(a).(i). State and explain how a converging lens is used as a simple microscope (3 mks)
(ii) Draw a diagram to show how prisms are applied as periscope (3 mks)
(b). A photographer focuses his camera on a group of people standing 3 meters from the lens .If the lens has a focal length of 100 mm, calculate the image distance and the linear magnification of the image. (2 mks)
(c). (I) Define (2mks)
(i.) Amplitude
(ii) Period
(iii) Wave length

(II) The equation of a certain traveling transverse wave is given by

$Y = 25 \cos \{ 6 \pi (120 t + 0.01 x)\}$

Where x and Y are in meters and t in minutes.

Determine from the equation
(i.) The frequency of the wave (3 mks)
(ii.) The speed of propagation of the wave (3mks)
(iii). Amplitude of the wave (1mk)
(d). state the two types of the interference in waves (2mks)

QUESTION 4(20 MKS)

a)(i.) State any two kinds of strain (1 mk)
(ii) Define and explain bulk modulus of elasticity in relationship with volume and pressure (2 mks)

(b). A mass of 100kg suspended from a wire whose un stretched length is 4M, is found to stretch the wire to 4.08M.The cross section area of the wire; which can be assumed to be constant is 0. $5cm^2$ .Determine Young's modulus of elasticity of the wire. (5mks)
(C)(i.) State and explain 3 factors that determine the critical velocity of a liquid in a tube (3 mks)
(ii). A plate of metal which is $180cm^2$ in area is resting in a layer of captor oil 5 mm thick, whose coefficient of velocity is $0.645N.s.cm^{-2}$ .Calculate the horizontal force required to move the plate with velocity of 25 cm/s. (4 mks)

QUESTION FIVE.

(a)A block of mass M is initially at rest on a frictionless surface at the origin. At t=0 a decreasing force of $F = F_0 e^{-kt}$
acts on it, determine the equation of X (t) and V(t) at any time t. (6 mks)
(b) The co-ordinats of a particle moving in the X-y plane is given as a function of time as $x = 5t$
$y = 35 - 4t^2$
Calculate
(i) The particle distance from the origin at time t = 3 seconds. (3 mks)
(ii) The magnitude of particle velocity at t = 2 seconds (3 mks)
(c) Define the following terms (1 mks)
(i)S.H.M
(ii)Rigid body motion

(d) State (2 mks)

(i) Hooke's law

(ii) Principle of conservation energy.

(e) A body of mass 20 kg moves with S.H.M of amplitude of 40cm and period of 8 seconds. Calculate the frequency of the S.H.M and the magnitude of force on the body at t = 0.45 seconds. (5 mks)