Paper 1

TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department Of Building and Civil Engineering

UNIVERSITY EXAMINATION FOR:

Diploma in Building and Civil Engineering (DBCE Y2 S1)

APS 2100 PHYSICAL SCIENCE FOR ENGINEERING

SPECIAL/ SUPPLIMENTARY EXAMINATIONS

SERIES: September 2018

TIME: 2 HOURS

<u>**Instructions to Candidates**</u>
You should have the following for this examination
-Answer Booklet, examination pass, scientific calculator, student ID and no mobile phones.
This paper consists of five questions. Attempt **any THREE** questions
Do not write on the question paper.

Question ONE

    (a)   Define the following terms as applied in dynamics   (5mks)
        (i)   Force
        (ii)   Acceleration
        (iii) Weight
        (iv) Mass
        (v)   Moment of force

    (b) (i)State at least four laws of dry, solid friction   (4mks)

(ii) Calculate the weight of the heaviest machine tool that could be steadily slid across a workshop floor by a uniform pull of 500 N on a rope inclined at angle $30°$. Assume the coefficient of friction between tool bed and floor is 0.4   (5mks)

(c) A uniform beam 1.5m long weighing 80 N is supported at both ends. Determine the position of a mass of 20.4kg that hangs from the beam if the reactions at the supports are in the ratio 2R:R   (6mks)

Question TWO

(a)   Define the following terms as applied in properties of matter
   (i)   Viscosity
   (ii)   Surface tension
   (iii)   Specific gravity
   (iv)   Vapor pressure
   (v)   Boiling point
   (vi)   Density   (6mks)
(b) A block of steel measures 50mm×40mm×80mm and has a mass of 1.2536kg.Determine its
   (i)   Density in kg/dm^2
   (ii)   Relative density
   (iii)   Specific weight in N/m^3 (9mks)

(c) In reference to matter, distinguish between physical and chemical changes that characterises its properties and explain and or define mixtures termed;
   (i)   Solutions
   (ii)   Suspensions
   (iii)   Colloids   (5mks)

Question THREE
(a)   State and explain the following terms as applied in electricity
   (i)   Ohms law
   (ii)   Resistance
   (iii)   Electric potential difference (p.d)

(iv)   Energy

(v)   Quantity (Q)   (5mks)

(b) A cell has on e.m.f of 2V and on internal resistance of 0.1 'Ω. Calculate the

(i)   Current flowing from the cell when a s-'Ω resistor is connected across its terminals

(ii)   Terminal p.d of the cell and

(iii)   the Energy wasted in the cell when operating for 20min.   (5mks)

(c) State, define or explain the following terms and do the necessary calculation in No. (iv) hereunder

(i)   Heat

(ii)   Temperature

(iii)   The three basic ways of transforming heat giving at least an example for each

(iv)   A copper pipe having a coefficient of linear expansion of 0.000017/^oC, is 6m long at 20^oC. What will be the increase in length when water at 70° C is passing through the pipe?   (10mks)

Question FOUR

(a)   Sate the following

(i)   Principle of conservation of energy

(ii)   Theorem of parallel axes

(iii)   Angular moment (moment of momentum)   (3mks)

(b)

(i)   Define simple harmonic motion

(ii)   With aid of a diagram show that for a rotating body about O, with angular velocity ω, particle of mass dm at radius L the moment of momentum about o is given by $I_G\omega$+mvh where G is the center of gravity and h is the distance from G (8mks)

(c) Given that for a compound pendulum $t_p = 2\pi \sqrt{\dfrac{k^2 + h^2}{gh}}$ where k is the radius of gyration about the center of gravity G and h the distance of the point of suspension from G. A spring of stiffness 2KN/m is suspended vertically and two equal masses of 4kg each are attached to the lower end. One of these masses is suddenly removed and the system oscillates. Determine the

(i) amplitude and frequency of the vibration

(ii) velocity and acceleration of the mass when passing through the half amplitude position and

(iii) the energy of the vibration in joules   (9mks)

Question FIVE

(a)   Determine the following as applied to atoms

(i)   Atomic number

(ii)   Mass number

(iii) Isotope

(iv)   Element

(v)   Oxidation

(vi)   Reduction

(b)   (6mks)

(i) show the atomic electron , structure of bromine atom with 25 electrons

(ii) State the three things that must happen to make an ionic compound

(iii)   Classify the following mercury samples as an element, compound or mixture

(a) Mercury liquid

(b) Mercury oxide

(c) Cinnabar ore

(d) Amalgam alloy   (10mks)

(c) Use the information provided in the table to answer the question below

10n/atom	Mass number	Neutron number	Atomic number	Number of electrons
Q		14	12	
R	23			11
X	35		17	

(i) What is the mass number of Q?

(ii) How many neutrons are there in an atom of element X?

(iii)   How many electrons are there in an atom of element X?

(iv)   What is the atomic number of element R?   (4mks)