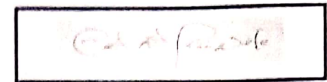




COURSE CODE: PHY 101
COURSE TITLE: GENERAL PHYSICS I
DURATION: 2 HOURS



Instructions: Attempt any 4 of the 6 questions; 2 questions from each section.

SECTION A

1(a) Mention two important applications of Dimension analysis.

(b) The velocity, V , of transverse waves along a string depends on the tension, F , in the string, its length l and its mass m .

$$V = kF^x l^y m^z \quad . \quad \text{Find } x, y, z .$$

(c) (i) What is Uniform velocity.

(ii) A train accelerates steadily from 58 Km/h to 82 Km/h in 20s. Find its acceleration.

2(a)(i) Differentiate between centripetal force and centrifugal force

(ii) A ball of radius 6.0cm rolls down an inclined plane from rest after 5.0s, its angular velocity is 9.0ms^{-1} find (a) its angular acceleration (b) its linear velocity after 5.0s

(b) With aid of a well labelled diagram and appropriate equations of motion, derive the time of flight T , of a projectile motion. State its implication.

3 (a) Differentiate clearly between acceleration and retardation

(b) A ball of radius 5.0cm rolls down an inclined plane from rest. After 4.0s, its angular velocity is 8.0 rad/s. Find (i) its angular acceleration (ii) its linear velocity after 4.0s.

(c) if $D = -5i + 6j - 3k$ and $E = 7i + 8j + 4k$

(i) Calculate $D \times E$

(ii) find the angle between D and E

(iii) show that $D \times E$ is perpendicular to both D and E

SECTION B

4 (ai). State the Work-Energy theorem.

(ii). List any 5 Forms of Energy

(b). Differentiate between the following (i) Conservative force and Non-conservative force

(ii) Elastic collision and Inelastic collision (iii) Torque and Rigid body

(c). A 7kg ball moving with a velocity of 5m/s collides with a 14kg ball moving a velocity of 8m/s in the opposite direction. Calculate (i) the velocity of the balls if they cleave on impact (ii) the loss of energy resulting from the impact

5(ai). State the Newton's Gravitational Law. (ii). What is Static Friction?

(b). A body of mass m is given an energy equal to $\frac{GMm}{R_e}$, the work done to move the body through a small distance x is given as $W = -\frac{GMmdx}{x^2}$, and the potential V is given as $\frac{Work}{mass}$. Determine the (i) velocity of the body (ii) escape velocity if the body falls freely near the surface of the earth.

(G =gravitational constant, M = Mass of the earth and R_e = Radius of the earth).

(c). A circular highway curve is designed for traffic moving at 57.4 Km/h. If the radius of the curve is 122m, calculate (i) the banking angle of the road (ii) If the road is not banked, calculated the minimum coefficient of friction between the road surface and the tyre that would keep traffic from skidding sideways at this speed.

6(ai). State the THREE Kepler's law about the solar system

(ii). State the condition on which Conical pendulum leads to Simples' pendulum

(b). (i) State the Newton's Second Law of Motion

(ii). What is the tension in a vertical rope pulling a block of mass 90kg with an acceleration of $3m/s^2$?

(c). A 70kg object was place on a lift that is moving with an acceleration of $5m/s^2$.

(a). Determine the reaction of the floor on the object when the lift moves

(i) up (ii) down

(b). Explain why a passenger sometimes has the feeling of 'weightlessness' in a lift.

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