Time: 1.5 hours   **Full Marks: 25**

Answer any FOUR **including question-1** from the followings

1. Answer the questions.   7.0
(i) What is rigid body?
(ii) Suppose the equation of velocity is v = u + at. How you can write this equation in terms of x and y?
(iii) When vertical part of applied force add with natural force for movement of the body?
(iv) What is the coefficient of friction force? Write also the equation for friction coefficient.
(v) Classify energy.
(vi) Write any two properties of simple harmonic motion.
(vii) What is the basic difference between displacement and amplitude of a sinusoidal wave?

2. (a) Define and classify friction force. Write the names of the depending parameter of friction forces.
                                                                              3.0
(b) A 30 kg box pulled on floor at an angle of 60° by 600 N of force with the horizontal plane. Starting from rest, the box achieves a velocity of 10 m/s in a time of 4 s. Find the coefficient of kinetic friction between the box and the floor.
                                                                              3.0

3. (a) Prove that, a projectile takes time double to strike the ground than the time to reaches maximum height.   3.0
(b) A cricket player hits a ball at an initial speed of 30 m/sec at a projection angle of 45°. Find (i) how long does the ball is in the air and (ii) what is the maximum horizontal range covered by the ball?
                                                                              3.0

4.(a) What do you mean by work and energy? Classify the energy. What is elastic potential energy?   3.0
(b) A block of mass 10.5 kg is to be pushed a distance of 8.66 m along an incline so that it is raised a height of 5 m. As summing frictionless surfaces, calculate how much work you would do on the block if you applied a force parallel to the incline to push the block up at constant speed.   Also   compare   the work to take the block directly from ground to top.   3.0

5. (a) From differential equation of simple harmonic vibration find the general equation of simple harmonic vibration [Y= a sin (ωt + Φ)].   5.0
(b) Draw a sinusoidal wave and show the amplitude and wavelength from figure.   1.0

6. (a) Derive the composition of two simple harmonic vibration right-angle to each other, having equal frequencies but different amplitude and constant phase difference.   3.0
(b) A simple harmonic motion equation is y = 10 sin (wt + φ). If the time period is 10 seconds and the particle has a displacement of 5cm at t = 0, Find (i) epoch, (ii) the phase angle at t = 10 sec and (iii) the phase difference between two positions of the particle 10 sec apart.   3.0