

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE

Semester – Spring

Year : 2010

Full Marks : 100

Pass Mark : 45

Course: Applied Mechanics (Dynamics)

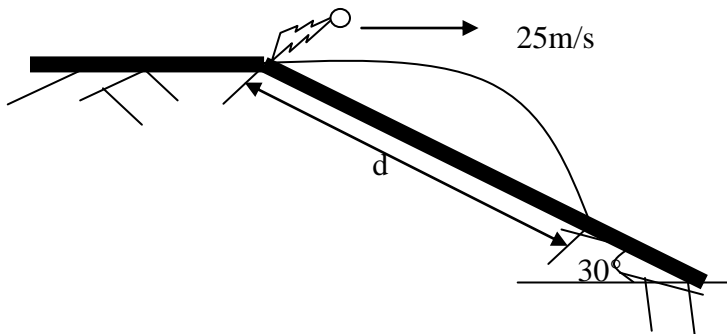
Time : 3 hrs

Candidates are required to give their answers in their own words as far as practicable.

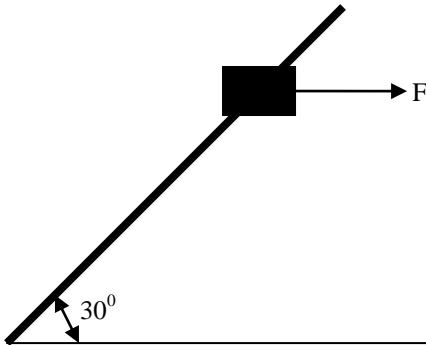
The figures in the margin indicate full marks.

Attempt all the questions.

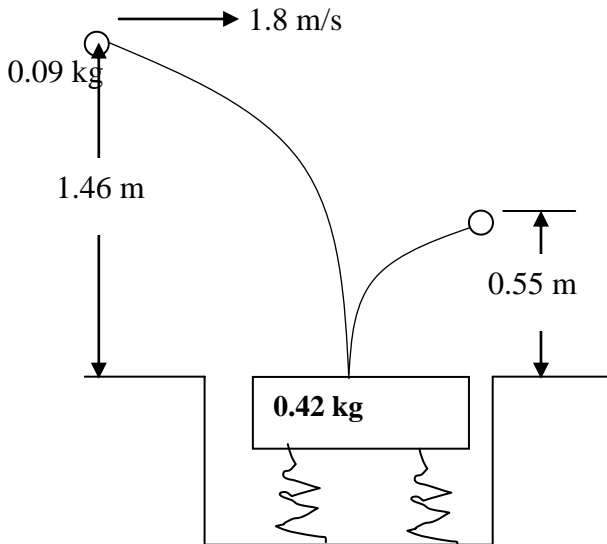
1. a. A ski jumper starts with a horizontal take off velocity of 25 m/s and lands on a straight landing hill inclined at 30° . Determine the maximum vertical distance between the jumper and the landing hill. 8



- b. A car is moving 72 km/hr, if the wheels have 75 cm diameter, find the angular velocity of the tyre about its axis. If the car comes to rest in a distance of 20m, under a uniform retardation, find the angular retardation of the wheels. 7
2. The 3 kg collar was moving down the rod with a velocity of 3 m/s when a force F was applied to the horizontal cable. Assuming a coefficient of friction 0.2 between the collar and rod. Determine the magnitude of force F if the collar stopped after moving 1 m more down the rod. 15

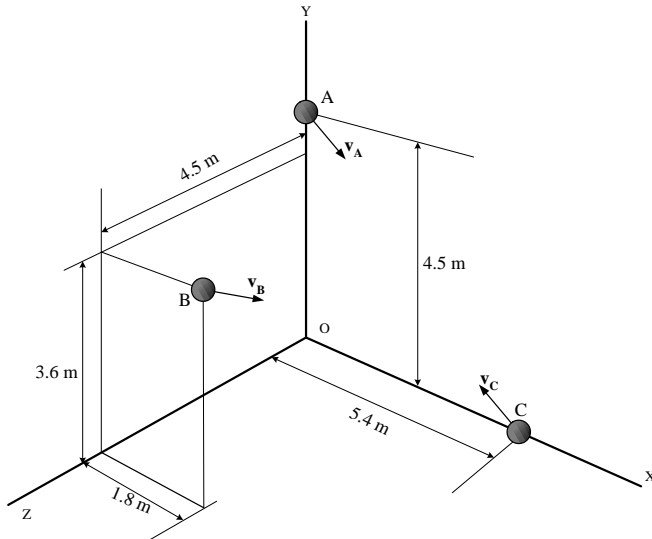


3. A 0.09 kg ball is projected from a height of 1.46 m with a horizontal velocity of 1.8 m/s and bounces from a 0.42 kg smooth plate supported by springs. Knowing that the height of the rebound is 0.55 m, determine (a) the velocity of the plate immediately after the impact, (b) the energy lost due to the impact. 15

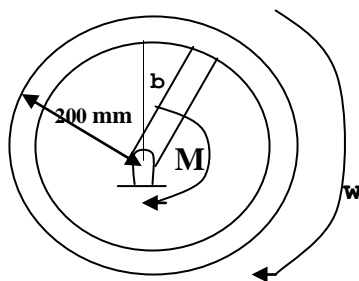


4. A system consists of three particles A, B, C. We know that $m_A = 5 \text{ kg}$, $m_B = 6 \text{ kg}$ and $m_C = 7 \text{ kg}$ that the velocities of the particles expressed in m/s are respectively, $\mathbf{v}_A = 2\mathbf{i} - 2\mathbf{j} + 5\mathbf{k}$, $\mathbf{v}_B = -4\mathbf{i}$ 15

$+ 8\mathbf{j}$, and $\mathbf{v}_C = -6\mathbf{i} - \mathbf{j} + 4\mathbf{k}$. Determine (a) the angular momentum \mathbf{H}_O of the system about O (b) linear momentum of the system and (c) mass center of the system.

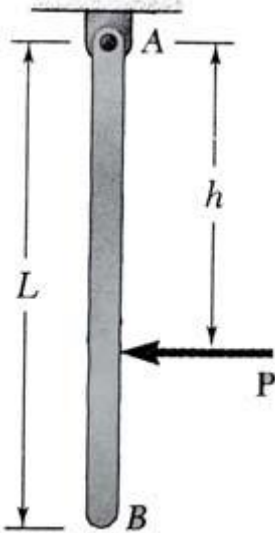


5. A uniform slender rod of mass 350 g/m is used to form the assembly shown. The assembly rotates clockwise at a constant rate of 120 rpm under the combined effect of gravity and the couple \mathbf{M} which varies in magnitude and sense. Determine the magnitude and sense of the couple \mathbf{M} and the reaction at point A for $\mathbf{b} = 90^\circ$ and 180° . 15



6. A uniform slender rod of length $L = 1.8$ m and mass $m = 5$ kg hangs 15

freely from a hinge at A. If a force P of magnitude 12 N is applied at B horizontally to the left ($h = L$), determine the angular acceleration of the rod.



7. Write short notes on **any two**: 5×2
- a. Kinetic energy of a rigid body in plane motion
 - b. Steady stream of particles
 - c. D'alemberts principle