

POKHARA UNIVERSITY

Level: Bachelor

Semester – Fall

Year : 2005

Programme: BE

Full Marks: 100

Course: Applied Mechanics

Time : 3hrs.

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 Concrete slab supports six vertical loads as shown in figure. Determine the resultant of these forces and the point through which it acts. 8
- b) Two identical rollers, each of weights 100 N are supported by an inclined plane and a vertical wall as shown in figure. Assuming smooth surfaces, find the reactions induced at the points of supports A, B, C and D. 7
2. a) Determine the co-ordinates of the centroid of the plane area shown in figure with reference to the axis shown. 7
- b) Block weighting 15 N is a rectangular prism resting on a rough inclined plane as shown in figure. the block is tied up with a horizontal string which has a tension of 5 N. Find (i) the frictional force on block, (ii) normal reaction of the inclined plane and (iii) the coefficient of friction between the surfaces of contact. 8

3. a) The motion of a particle is defined by the relation $x = 2t^3 - 15t^2 + 24t + 4$, where x and t are expressed in meters and seconds, respectively. Determine (a) when the velocity is zero, (b) the position and the total distance travelled when the acceleration is zero. 7
- b) A basketball player shoots when she is 5 m from the backboard. Knowing that the ball has an initial velocity v_0 at an angle of 30° with the horizontal, determine the value of v_0 when d is equal to 220 m. 8
4. The two blocks shown from rest. The horizontal plane and the pulley are frictionless, and the pulley is assumed to be of negligible mass. Determine the acceleration of each block and the tension in each cord. 15

5. A 5 kg block is attached to an outstretched spring of constant $k = 2 \text{ kN/m}$. The coefficients of static and kinetic friction between the block and the plane are 0.60 and 0.40, respectively. If a force F is slowly applied to the block until the tension in the spring reaches 90 N and then suddenly removed, determine the velocity of the block as it returns to its initial position. 15

OR

Two bodies weighting 300 N and 450 N are hung to the ends of a rope passing over an ideal pulley as shown in figure. How much distance the blocks will move in increasing the velocity of system from 2 m/s to 4 m/s? How much is the tension in the string?

6. A slender beam AB of length 3 m which remains always in the vertical plane has its ends A and B constrained to remain in contact with a horizontal floor and a vertical wall respectively as shown in figure. Determine the velocity and acceleration of the end B at the position shown in the figure. If the point A has a velocity of 2 m/s and an acceleration of 1.6 m/s^2 towards left. 15

OR

The flywheel shown has a radius of 500 mm, a mass of 120 kg, and a radius of gyration of 375 mm. A 15 kg block A is attached to a wire that is wrapped around the flywheel, and the system is released from rest. Neglecting the effect of friction, determine (a) the acceleration of block A, (b) the speed of block A after it has moved 1.5 m.

7. ***Write short notes on (Any Two)***

5×2

- a) Equilibrium
- b) Laws of friction
- c) Angular Momentum
- d) Rolling Motion