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Part I	Q1	Q2	Q3	Total

PART I: choose the correct answer

(18×4=72 pts)

1) If the force F is related to the velocity v as $F = -bv$, the unit of the constant b is

- a) kg/s b) N.m c) N/m d) N.m/s

2) If $\mathbf{A} = 2\mathbf{i} - 3\mathbf{j}$ and $\mathbf{B} = \mathbf{i} - 2\mathbf{j}$, then $\mathbf{A} - 2\mathbf{B}$ equal to

- a) $-\mathbf{j}$ b) $4\mathbf{i} - 7\mathbf{j}$ c) $4\mathbf{i} + \mathbf{j}$ d) $\mathbf{j}$

3) If $\mathbf{A} = 2\mathbf{i} + 6\mathbf{j} - 3\mathbf{k}$ and $\mathbf{B} = 4\mathbf{i} + 2\mathbf{j} + \mathbf{k}$, then $\mathbf{A} \cdot \mathbf{B}$ equal to

- a) $8\mathbf{i} + 12\mathbf{j} - 3\mathbf{k}$ b) $12\mathbf{i} - 14\mathbf{j} - 20\mathbf{k}$ c) 17 d) 23

4) The coordinates of a particle in meters is given by $x = 12 - 3t^2$, where t in seconds. the instantaneous acceleration of the particle at $t = 2$ s is

- a) 6 m/s^2 b) -6 m/s^2 c) 12 m/s^2 d) -12 m/s^2

5) A ball is thrown vertically upward with initial speed of 6 m/s. It hits the ground with a speed of 12 m/s. The average velocity of the ball is

- a) 9 m/s up b) 9 m/s down c) 3 m/s up d) 3 m/s down

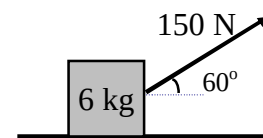
6) A ball is thrown directly upward from a truck that is moving with constant speed of 40 km/hr on a straight horizontal road. The ball will fall

- a) in front of the truck. b) behind the truck.
c) on the truck. d) depends on the initial speed of the ball.

7) A boat is sailing at 12 m/s 30° west of north with respect to a river that is flowing at 6 m/s due east. The velocity of the boat relative to the ground is

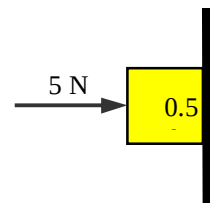
- a) 30° east of north b) due north c) 30° west of north d) 45° east of north

8) A block of mass $m = 6 \text{ kg}$ rests on a smooth horizontal surface. It is pulled to the right by a force of 150 N that makes an angle of 60° with the horizontal, as shown. The force exerted on the block by the surface is



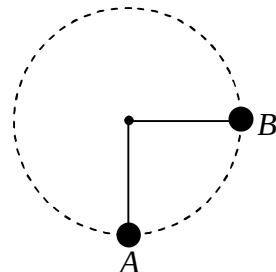
- a) 58.8 N b) 0 c) 16.2 N d) -16.2 N

9) A horizontal force of 5 N pushes a 0.5 kg block against a vertical wall as shown. If $m_s = 0.6$ and $m_k = 0.4$, the acceleration of the block is



- a) 9.8 m/s^2 b) zero c) 3.8 m/s^2 d) 5.4 m/s^2

10) A small ball of mass 1.2 kg, attached to a string of length 0.8 m, moves in a vertical circle. Its speed at point A is 4 m/s, the tension at point A is



- a) 20 N b) 11.8 N c) 12.2 N d) 35.8 N

11) A 4-kg block starts up an incline with a speed of 3 m/s and comes to rest 2m up the incline. The net work done on the block is

- A) 18 J b) 12 J c) 6 J d) not enough information given

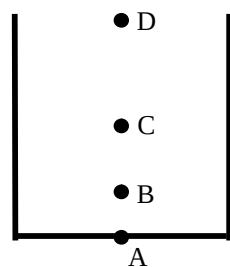
12) The unit of power is

- a) J.s b) J/s c) J.m d) J/m

13) A potential energy (P.E) can be associated with

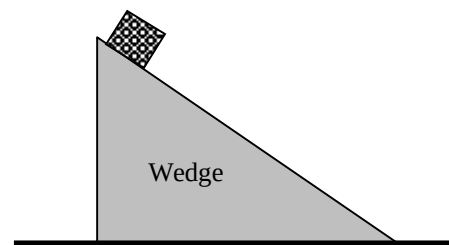
- a) any force. b) any conservative force.
c) any non-conservative force. d) there is no relation between force and P.E.

14) A thick uniform wire is bent into the shape of the letter U as shown. Which point indicates the location of the center of mass of the wire.



- a) A b) B c) C d) D

15) A large wedge rests on a smooth horizontal surface. A block starts from rest at the top and slides down the inclined, rough surface of the wedge as shown in the figure. During the motion of the block, the center of mass of the block and the wedge



- a) does not move b) moves horizontally.
c) moves vertically. d) moves both horizontally and vertically.

16) The unit of power is

- a) kg/m b) kg/m.s c) N/s d) N.s

17) A ball of mass 1 kg moving at 2 m/s perpendicular to a wall rebounds at 1.5 m/s. The change in momentum Δp is

- a) 0.5 kg.m/s away from the wall. b) 0.5 kg.m/s toward the wall.
c) 3.5 kg.m/s away from the wall. d) 3.5 kg.m/s away from the wall.

18) The collision is elastic if

- a) momentum is conserved but kinetic energy is not. b) both momentum and kinetic energy are conserved.
c) kinetic energy is conserved but momentum is not. d) neither momentum nor kinetic energy is conserved.

19) A 1-kg block is traveling at 10 m/s. It strikes a 2-kg block which is stationary. The two blocks stick together. Their common final speed is

- a) 5 m/s b) 3.3 m/s c) 10 m/s d) zero

20) If a wheel rotates at constant angular velocity of 3 rad./s, the time it takes to complete one revolution is

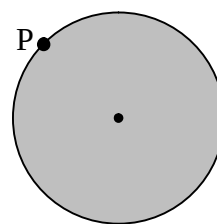
- a) 0.33 s b) 0.67 s c) 1.3 s d) 2.1 s

21) A wheel initially rotating at 18 rad./s but slowing at a rate of 2 rad./s^2 . When it is stopped, it will have turned through

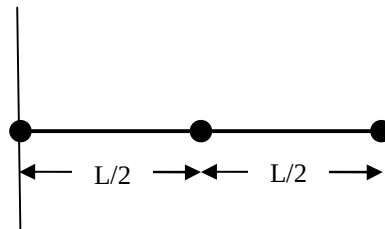
- a) 13 rev. b) 26 rev. c) 39 rev. d) 81 rev.

22) The figure shows a disk of radius 0.7 m rotating about the origin at 10 rad./s. The linear speed of point P is

- a) 0.7 m/s b) 7 m/s c) $7\pi \text{ rad./s}$ d) $14\pi \text{ rad./s}$



23) Three identical objects of mass M are fastened to a massless rod of length L as shown. The moment of inertia about one end of the rod is

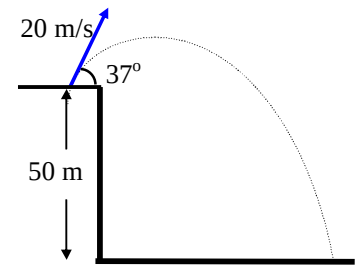


- a) ML^2 b) $\frac{5}{4}ML^2$ c) $\frac{3}{2}ML^2$ d) $3ML^2$

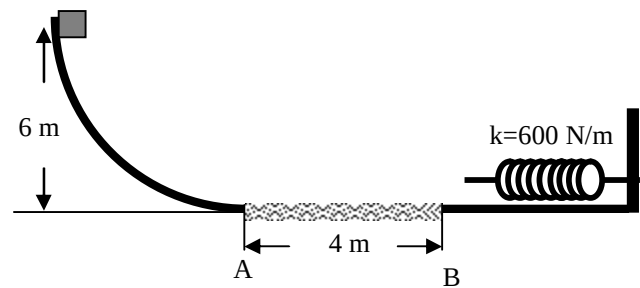
PART II: Solve the following two problems

(2×15=30 pts)

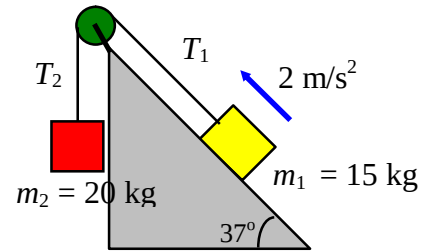
Q1) A ball is thrown from the top of a building 50 m in height. If the ball is thrown upward with a speed of 20 m/s that making an angle of 37° with the horizontal, what is the velocity of the ball just before it hits the ground?



Q2) A 5-kg block is released from rest at the top of the track shown in Figure 7.17. The track is 6-m high and smooth except for the portion AB whose length is 4 m, where $\mu_k = 0.4$. At the end of the track the block hits a spring of force constant 600 N/m. What is the maximum compression of the spring?



- Q4)** In the figure, two masses are connected by a string of negligible mass passing over a pulley of radius 0.25 m and moment of inertia I . The block m_1 is moving up with constant acceleration of 2 m/s^2 . Find the tensions T_1 and T_2 and the moment of inertia of the pulley.



- Q5)** A uniform bar of weight 80 N and length 1.2 m is attached to a wall with a hinge at one end. The other end is supported by a string that makes 30° with both the wall and the bar, as shown. Find the tension in the string and the rectangular components of the force of the hinge on the bar.

