

تمنع الكتابة على غير ورقة الإجابة ولن يلتفت إلى أية ورقة خارجية

The Islamic University
Date: February 18, 2009

G. Physics A (PhysA1301)
Final Exam

Dept. of Physics
Time: 2 Hr

اسم الطالب/ة: الرقم الجامعي: اسم المدرس:

Part I () × 2 =	Part II						Total
	Q1	Q2	Q3	Q4	Q5	Q6	

Part I: Choose the correct answer:

$$g = 9.8 \text{ m/s}^2$$

20×2.5=50 pts

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

- a) $2i + j - k$ b) $3i + j - k$ c) 2 d) 4

2) If $\mathbf{A} = i$ and $\mathbf{B} = 5i + 3j$, then $\mathbf{A} \times \mathbf{B}$ equal to

- a) $3k$ b) $-3k$ c) 5 d) 3

3) The position of a particle is given by $x = t^2 + 3t$, where x in (m) and t in (s). The instantaneous acceleration at $t=2s$ is

- a) 7 m/s^2 b) 4 m/s^2 c) 10 m/s^2 d) 2 m/s^2

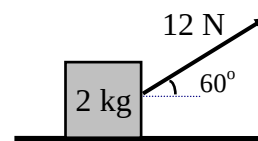
4) An object is thrown vertically downward with initial speed of 10m/s. What is its velocity after 1sec

- a) 9.8 m/s b) 0.2m/s c) -19.8m/s d) -9.8m/s

5) A projectile is thrown with a speed of 20m/s at an angle of 60° above the horizontal, the speed of the projectile at its maximum height is

- a) 17.32 m/s b) 20m/s c) 0 d) 10m/s

6) A block of mass $m = 2 \text{ kg}$ rests on a smooth horizontal surface. A force of 12N that makes an angle of 60° with the horizontal is applied to the block, as shown. The force exerted on the block by the surface is



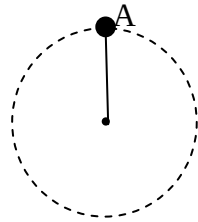
- a) 19.6 N b) 9.2 c) 0 N d) 13.6 N

- 7) The direction of the centripetal acceleration is
 a) outward from the center b) inward to the center.
 c) tangent to the circle. d) depends on the centripetal force.

- 8) A particle moves in a circle with varying speed. Its acceleration is
 a) centripetal only b) tangential only c) both of them d) non of them

- 9) A small ball of mass 2kg attached to a string of length 0.5m, moves in a vertical circle as shown in the figure. Its speed at point A is 10m/s, the tension at point A is

- a) 380.4 N b) 200 N
 c) 419.6 N d) 400 N



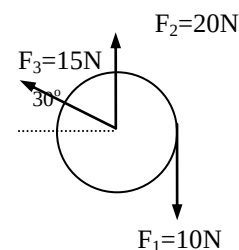
- 10) The gravitational force between two objects is inversely proportional to
 a) the distance between them b) the square of the distance between them
 c) the mass of the earth d) the product of their masses

- 11) The unit of power is
 a) Joule/s b) kg.m/s^2 c) kg.m/s d) Joule

- 12) The unit of 1 J is equal to
 a) 1 N/m b) 1 N/s c) 1 Watt d) 1 N.m

- 13) A car of mass 1000kg traveling with a speed of 10m/s collides in one-dimension with a 4000-kg truck initially at rest. If the car and truck move together after collision with a speed of 2m/s, the impulse delivered to the car is
 a) 10000kg.m/s b) -8000kg.m/s c) 2000kg.m/s d) zero

- 14) A wheel of radius $R=1\text{m}$ and mass $M=6\text{kg}$ can rotate about an axis passing through its center. Three forces are acting on the wheel as shown in the figure. The net torque on the wheel is given by



- a) -10 N.m b) 17.5 N.m c) 17 N.m d) 37.5 N.m

- 15) Referring to the previous problem, if the moment of inertia of the wheel is given by ($I = 0.5 MR^2$), the angular acceleration of the wheel is
 a) 5.67rad/s^2 b) 3.33rad/s^2 c) 5.83rad/s^2 d) non of the them
- 16) The unit of moment of inertia is
 a) $\text{kg}\cdot\text{rad/s}$ b) $\text{kg}\cdot\text{m/s}$ c) $\text{kg}\cdot\text{m}$ d) $\text{J}\cdot\text{s}^2$
- 17) A rigid body is in static equilibrium when
 a) the resultant external force and the resultant external torque are both zero
 b) the resultant external force acting is zero
 c) it rotates with constant ω
 d) the resultant external torque acting is zero
- 18) The displacement of a simple harmonic oscillator varies with time according to $x = \cos(\pi t + \pi/3)$, where x in m and t in sec. The phase constant is
 a) π rad b) 60 rad c) $\pi/3$ rad d) 180 rad
- 19) Referring to the previous problem, the maximum velocity is
 a) 180m/s b) $\pm \pi/3\text{m/s}$ c) 1m/s d) 3.14m/s
- 20) The mechanical energy of a simple harmonic oscillator is given by
 a) $0.5kA^2$ b) $0.5kx^2$ c) $0.5mv^2$ d) $0.5k\omega^2$

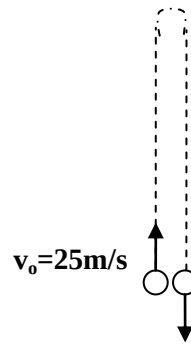
Part II: Solve the following problems:

5×10=50 pts

Q1)

An object is thrown vertically upward with an initial speed of 25m/s.

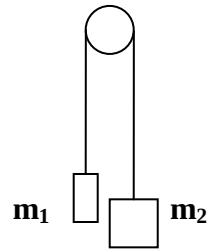
a) How long does it take to reach the maximum height.



b) What is its velocity just before hitting the ground.

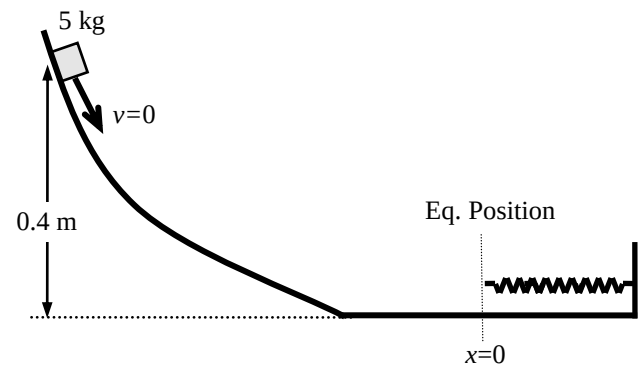
Q2)

Two blocks of mass $m_1=5\text{kg}$ and $m_2=8\text{kg}$ are suspended vertically by a light string that passes over a light frictionless pulley. Calculate **the acceleration of the system and the tension in the string.**



Q3)

- a)** A small mass of 5 kg is released from rest on a smooth track as shown in the figure. At the end of the track the mass collides with a spring of $k=1000$ N/m. Find the **maximum compressing distance** of the spring.

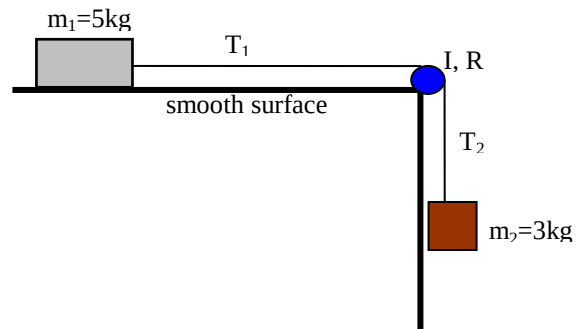


- b)** Referring to the previous problem, if the track is rough and the maximum compressing distance of the spring is 0.1m. calculate the **work done by friction**.

Q4)

In the figure, the radius of the pulley is 10cm, and the system starts from rest. The mass m_1 moves a distance 4m in 2s.

a) Find the tension T_1 and T_2 .



b) Find the moment of inertia of the pulley.

Q5)

A uniform beam of weight 100N and length 4m is pinned to a vertical wall. The other end of the beam is connected to the wall by a string as shown in the figure. A block of weight 200N rests on the beam at a distance 0.6m from the wall. Find **the force exerted on the beam by the wall**.

