The Hashemite University
Department of Physics

Second Semester **General Physics (101)** **Time : 1 hour**
First Exam

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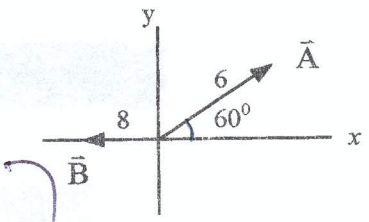
1) In the diagram shown , the resultant vector $\vec{A} + \vec{B}$ is :

a) $-5\hat{i} + 3\sqrt{3}\,\hat{j}$
b) $14\hat{i} - 3\sqrt{3}\,\hat{j}$
c) $3\sqrt{3}\,\hat{i} + \sqrt{5}\,\hat{j}$
d) $3\hat{i} + 3\sqrt{3}\,\hat{j}$
e) $-8\hat{i}$



2) If $\vec{A} = -\hat{i} + 6\hat{j}$ and $\vec{B} = 3\hat{i} - 2\hat{j}$, then the angle between $\vec{A}$ and $\vec{B}$ is :
a) 46.8^0 b) 88.2^0 c) 133.2^0 d) 41.7^0 e) 80.5^0

3) If $\vec{C} = \vec{A} + \vec{B}$ and $C = A + B$, then $\vec{A}$ and $\vec{B}$ are :
a) perpendicular b) Parallel c) antiparallel
d) have an angle of 30^0 between them e) none of these

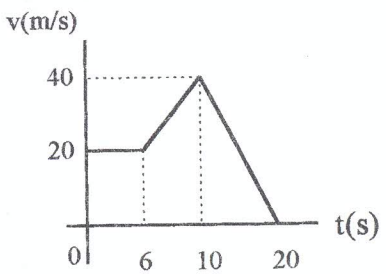
4) A particle moves a long the x-axis such that $v(t) = t^2 - 4$. When the particle is momentarily at rest , the instantaneous acceleration (m/s^2) of this particle is :
a) 3 b) 5 c) 7 d) 4 e) 1

5) A car slows from 36 to zero m/s in 18 s . The distance (m) travelled by this car is :
a) 174 b) 100 c) 220 d) 437 e) 324

6) A ball is thrown vertically upwards with an intial velocity of 20 m/s . The magnitude of the acceleration (m/s^2) of the ball is :
a) 10 b) 5 c) 1 d) depends on time
e) more information needed to answer the question .

7) The graph shows the velocity of a motorcycle police officer plotted as a function of time . The instantaneous acceleration (m/s^2) at $t = 8$ s is :

a) Zero
b) 5
c) 7
d) 10
e) 15

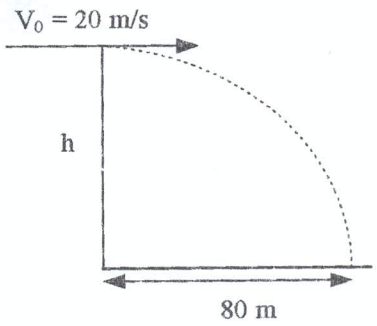


8) A particle moves in the *x*-y plane with a constant a cceleration $\vec{a} = -4\hat{j}$ m/s^2 . At t = 0 its position is $10\,\hat{i}$ m and its velocity is $-2\hat{i} + 8\hat{j}$ m/s . Find the distance from the orign to the particle at t = 2 s .

a) 2 b) 7 c) 9 d) 15 e) 10

9) A stone is thrown horizontaly with a speed of 20 m/s from the top of a cliff of height h as shown . It strikes the ground 80 m from the base of the cliff . Find the speed (m/s) of the ball just before it hits the ground .

a) 20.1
b) 50.9
c) 44.7
d) 40.3
e) 85.6



10) The speed of a particle moving in a circle 2 m in radius increases at the constant rate of 4.4 m/s^2 . At an instant when the magnitude of the total accleration is 6 m/s^2 , what is the speed (m/s) of the particle ?

a) 3.9 b) 3.5 c) 2.9 d) 3.0 e) 4.2

1	2	3	4	5	6	7	8	9	10

GOOD LUCK

The Hashemite University
Faculty of Science and Arts
Department of Physics

First semester

Time: 1 hour

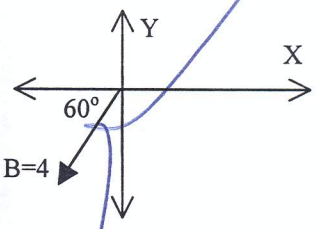
Physics 101 First Exam

إسم الطالب (باللغة العربية): ..... الرقم الجامعي: .....

إسم مدرس المادة: ..... الشعبة: .....

Please note that:
1. Acceleration due to gravity, g = 10 m/s^2.
2. Encircle the answer that is nearest to your correct answer.

Q1) If $\vec{A} = 3\hat{i}+\hat{j}$ and $\vec{B}$ is as shown below, then the vector $\vec{C} = \vec{A} - \vec{B}$ is:



a) $-\hat{i}+2.5\hat{j}$ b) $-5\hat{i}+4\hat{j}$ c) $5\hat{i}-4\hat{j}$ d) $5\hat{i}+4.5\hat{j}$ e) $\hat{i}-2.5\hat{j}$

.....

Q2) A ball is thrown vertically upward with an initial speed of 5 m/s. The acceleration (in m/s^2) of the ball at its highest point is:

a) 5 b) 10 downward c) 10 upward d) None of above e) zero

.....

Q3) If $A = B^n C^m$ where A has the dimensions of LT, B has the dimensions of $L^2 T^{-1}$, and C has the dimensions of LT^2, then the exponents n and m have respectively (على التوالي) the values of:

a) 2 & 3 b) 4/5 & -1/5 c) 1/5 & 3/5 d) 1/2 & 1/2 e) 2/3 & 1/3

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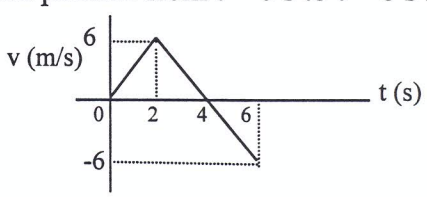
Q4) The figure shows the velocity (in m/s) of a particle as a function of time in one dimension. The total displacement (in m) of the particle from t = 0 s to t = 6 s is:



a) 18 b) 6 c) 2 d) zero e) 12

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Q5) The position of an object moving in one dimension is given by:

$$x(t) = 12\,t - t^3$$

Where x is in meters and t is in seconds.

When the object is momentarily (لحظياً) at rest its acceleration (in m/s^2):

a) 6 b) -9 c) -12 d) ? e) zero

.....

Q6) A stone is thrown vertically upwards from the ground with an initial speed of 100 m/s. The time (in s) at which the stone is moving at speed of 20 m/s downwards is:

a) 12 b) 5 c) 15 d) 20 e) 10

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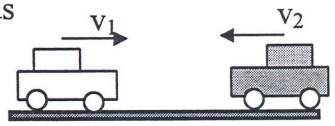
Q7) Two cars are 20 km apart and moving at constant speeds toward each other on a straight line road. One car is moving at 35 km/hr and the other at 45 km/hr. In how many hours will they meet?



a) 2 b) 0.25 c) 1.5 d) 0.75 e) 1

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Q8) If vector $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = c\hat{k}$. If $|\vec{A}\times\vec{B}| = 10$, then the value of c is:

a) 18 b) $6\hat{j}$ c) zero d) 2 e) 3

.....

Q9) If a person runs once around a circular track (دورة واحدة فقط) of radius 64 m in 40 s, then the person's average speed (in m/s) is:

a) 10 b) 402 c) 3.2 d) 5 e) zero

.....

Q10) The angle between $\vec{A} = \hat{i} + 3\hat{j} - 5\hat{k}$ and the positive y-axis is:

a) 59.5° b) 70.9° c) 120.1° d) 161.4° e) zero

THE HASHEMITE UNIVERSITY
FACULTY OF SCIENCE AND ARTS
PHYSICS DEPARTMENT

Summer Session
General physics 1(0102101) **Time : 2 hrs.**
First Exam.

الإسم:	الرقم الجامعي :

I: Encircled the correct answer (2points each question)

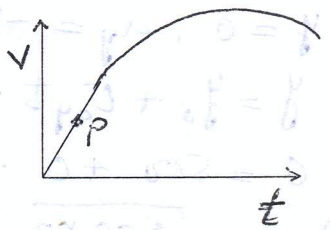
1.If $\mathbf{A= B^m/C^n}$, where **A** has dimensions $\mathbf{L/T^2}$, **B** has dimensions **L/T** and **C** has dimensions **L** . Then the exponents n and m have the values ::
(a) 1,2
(b) 1/2 ,1
(c) 2,1
(d) 1,1/2

2.: If Vector $\vec{A}$ **= 1 i + 3j + 2k** and vector $\vec{B}$ **= 3i + 4j** . The **angle** between the two vectors **A and B** is :
(a) 37
(b) 30
(c) 43
(d)56

3. An object is thrown vertically upward while it is **rising** :
(a) its velocity is upward and its acceleration is downward
(b) its velocity and acceleration are both downward
(c) its velocity and acceleration are both decreasing
(d) its velocity and acceleration are both upward

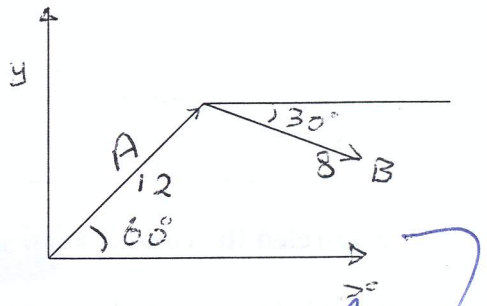
4. A car moving with an initial velocity of **50 m/s** has a constant acceleration of **10 m/s^2** after **6** seconds its velocity will be :
(a)158 m
(b) 110 m
(c)160 m
(d) 706 m

5 The diagram shows a **velocity time graph** for a car moving in a straight line . At point p the car must be : .
(a) moving with constant velocity
(b) stationary
(c) accelerated at constant acceleration
(a) moving at about 30 with respect to x-axis



6. If vector $\vec{A}$ has a magnitude of **12** meters and vector $\vec{B}$ has a magnitude of **8** meters as shown . The magnitude of **A + B** is :

(a) 5.6 m
(b) 8.6 m
(c) 12.6 m
(d) 14.4 m



7.Starting at time **t = 0** , an object moves along a straight line . Its coordinates in meters is given by $\mathbf{X(t) = 75\,t - t^3 + 5\,t^2}$. Where t is in seconds . Calculate its velocity and acceleration at **t = 2 s**

$$x(t) = 75t - t^3 + 5t^2$$

$$v(t) = \frac{dx}{dt} = 75 - 3t^2 + 10t$$

$$v(2) = 75 - 3(2)^2 + 10(2) = 83 \text{ m/s}$$

$$a(t) = \frac{dv}{dt} = 0 - 6t + 10$$

$$a(2) = -6(2) + 10 = -2 \text{ m/s}^2$$

8. An airplane at altitude of **0.5 km** and speed of **180 km/h** .At what distance should it release a heavy bomb to hit a target at X :

$$v_{ox} = 180 \text{ km/h} = \frac{180 \times 10^3}{3600} \frac{m}{s} = 50 \text{ m/s}$$

Starting with y-motion

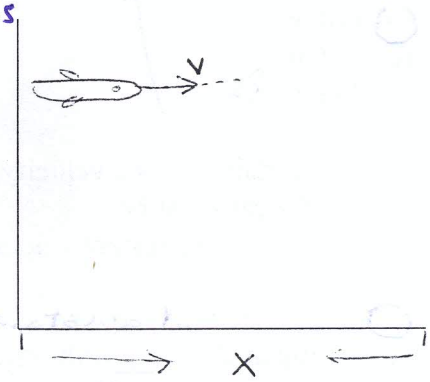
$$v_{oy} = 0, \quad y_0 = 0.5 \text{ km} = 500 \text{ m}$$

$$y = 0, \quad a_y = -9.8 \text{ m/s}^2$$

$$y = y_0 + v_{oy}t + \frac{1}{2}a_y t^2$$

$$0 = 500 + 0 + \frac{1}{2}(-9.8)t^2$$

$$\Rightarrow t = \sqrt{\frac{500 \times 2}{9.8}} = 10.1 \text{ s}$$



$$x = v_{ox}\,t = 50 \times 10.1 = 505 \text{ m} = 0.5 \text{ km}.$$

9. A particle starts from the origin at $\mathbf{t = 0}$ with a velocity $\vec{V} = \mathbf{12\,i + 18\,j}$ m/s and moves in the X – Y plan with a constant acceleration $\vec{a} = \mathbf{-3i - 4j}$ m/s^2 . Determine the displacement of the particle at $\mathbf{t = 3\ s}$.

10. A projectile has an initial velocity $\vec{V} = \mathbf{30i + 20\,j}$ from a horizontal surface . determine the maximum height of the projectile .

The Hashemite University

Physics Department **General Physics # # # 101** **First Exam.**

Second Semester
2000/2001 Time : One hour

Student's Name: .....
Student's Number: .....
Student's Class No.: .....
Instructor's Name:

Put a circle around the correct answer for each of the following problems:

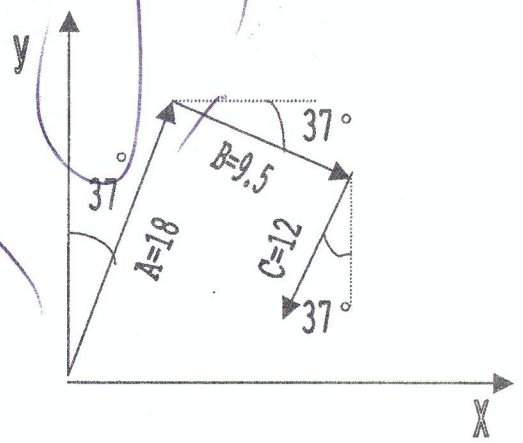
Notes: *Take* $g = 10\ ms^{-2}$

$\sin 37^\circ = 0.6$ *and* $\cos 37^\circ = 0.8$

Q1. The displacement of an object is given by $s = ka^m t^n$, where k is a dimensionless constant, a is the acceleration and t is the time. The values of m and n, respectively, are:

a. *1 and 3* b. 2 and 1 c.zero and 1 d. 3 and 2 e. 1 and 2

Q2. In the vector diagram shown, the magnitude of the resultant vector is:

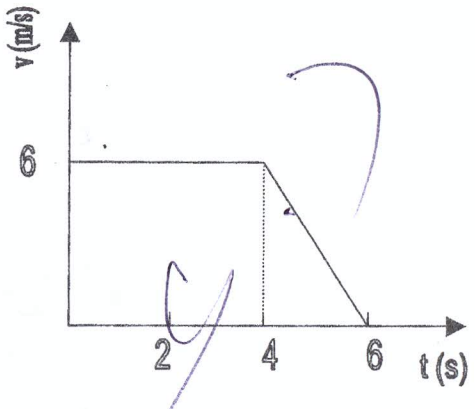


a. 11.2 b. 12.6 c. 13.4 d. 39.5 e. 21

Q3. A car travels on a straight road for 40 km at 30 km/h. It continues in the same direction for another 40 km at 60 km/h. The average velocity (in km/h) of the car is:

a. 10 b. 30 c. 50 d. 72 e. 40

Q4. The velocity versus time graph for an object moving along a straight line is shown in the figure. The total distance (in meters) covered by the moving object in the time interval between t=2s to t=6s is:



a. 12 b. 18 c. 30 d. 15 e. 6

Q5. The relationship between the position of a body moving along the x-axis and time is given by $x = 2t^3 + 2t$, where x in meters and t in seconds. The average velocity (in m/s) of the body between the times $t = 2$ s and $t = 4$ s is:

a. 54 b. 30 c. 58 d. 120 e. 136

Q6. A balloon is travelling vertically upward at a constant speed of 10m/s. When it is at 30m above the ground, an object is released from the balloon. The time (in seconds) needed for the object to reach the ground is:

a. 3.0 b. 3.6 c. 9.0 d. 4.6 e. 4.0

Q7. A projectile was fired at θ_o above the horizontal. At the highest point of its trajectory its speed was 200 m/s. If air resistance is ignored, the magnitude of the initial velocity (in m/s) is:

a. 0 b. 200 cos (θ_o) c. 200/cos (θ_o) d. 200/ sin (θ_o) e. 200 sin (θ_o)

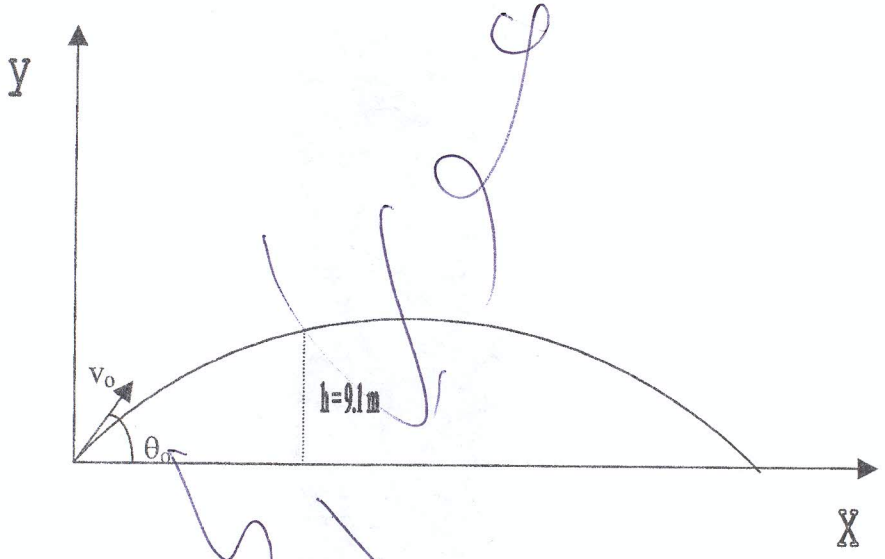
Q8. The acceleration of an object moving in the x-y plane is $\vec{a} = 3\hat{i} - 2\hat{j}$ m/s^2 and its initial velocity is $\vec{v}_o = 2\hat{i} + 4\hat{j}$ m/s. Its velocity $\vec{v}$ at t=2s is:

a. $8\hat{i}$ b. $-4\hat{i} + 8\hat{j}$ c. $\hat{i} + 6\hat{j}$ d. $5\hat{i} + 2\hat{j}$ e. $8\hat{i} + 8\hat{j}$

Q9. The position vector of a particle as a function of time is $\vec{r} = 2t\hat{i} + \left(5 - t^2\right)\hat{j}$ where r is in meters and t in seconds. The time (t>0) (in seconds) when the velocity vector $\vec{v}$ is perpendicular to $\vec{r}$ is:

a. 2 b. 1.73 c. 0.41 d. 1.93 e. 2.83

Q10. A ball is thrown from the ground as shown in the figure. Its velocity at a height h=9.1m is. $7.6\hat{i} + 6.1\hat{j}$ m/s. Its maximum height (in meters) is: -



a. 1.0 b. 9.6 c. 14 d. 11 e. 20

Key

The Hashemite University

Department of Physics **Physics 0102101**

First Examination **Time : One hour**

الاسم: ---------- الرقم الجامعي: ---------- رقم الشعبة: ---- مدرس المادة: ----------

Each question is worth 2 points. Assume that the acceleration due to gravity g=10 m/s^2.

For the following 8 questions, choose the correct answer (one answer only).

1. There is no SI basic unit for "area" because:

   a) area is not an important physical quantity.
   b) it is not possible to express area in m^2.
   c) area has no thickness, thus the unit for area is not defined.
   d) area can be expressed in terms of m^2.
   e) area has no units to start with.

2. Suppose $A = B^{1/5} C^{3/5}$ where B has dimensions $\frac{L^2}{T}$ and C has dimensions LT^2. Then A has dimensions:

   a) $\frac{L}{T}$ b) L T c) $L^2 T$ d) L^2T^2 e) $\frac{L^2}{T}$

3. The velocity v in m/s of a car not moving under constant acceleration is given by $v = a t^2 + b t^3$, where the time t is in seconds. The units of a and b are respectively:

   a) L/T^3; L/T^4 b) $m.s^2$; $m.s^4$ c) $L.T^2$; $L.T^4$ d) m/s^3; m/s^4 e) m/s^2; m/s^3

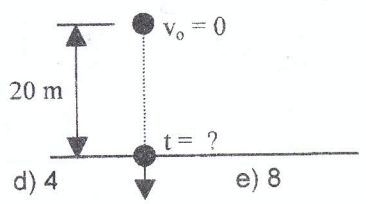
4. An object moving along the x axis has a position given by $x = (24\ t - 2\ t^3)$ m, where t is measured in seconds. What is the acceleration (in m/s^2) of the object when it is not moving (v=0) ?

   a) zero b) –12 c) –24 d) +12 e) +24

5. A car starts from rest from point A with a velocity of 30 m/s for 5 seconds till it reaches point B. At point B, the car starts to accelerate with an acceleration a = 5 m/s^2 for 6 seconds till it reaches point C. The total distance (in m) between points A and C is:

   a) 150 b) 270 c) 320 d) 350 e) 420

6. A stone is released from rest from the edge of a building 20 m above the ground. The **time** (in s) it takes, just before striking the ground, is:



   a) 2 b) 20 c) 10 d) 4 e) 8

7. If $\vec{C} + \vec{B} = -9\,\hat{i} - 8\,\hat{j}$, and $\vec{C} - \vec{B} = 5\,\hat{i} + 4\,\hat{j}$, the direction of $\vec{B}$ is:

   a) 41° b) 221° c) 66° d) 236° e) 206°

8. When two vectors $\vec{A}$ and $\vec{B}$ (magnitudes: A=10 units and B=16 units) are subtracted, the resultant vector $\vec{C} = \vec{A} - \vec{B}$ has magnitude C=21 units. What is the angle between the two vectors $\vec{A}$ and $\vec{B}$?

   a) 123° b) 114° c) 105° d) 75° e) 94°

SHOW YOUR WORK IN DETAILS. Each question is worth 2 points

9. If $\vec{A} = 12\,\hat{i} - 16\,\hat{j}$ and $\vec{B} = -24\,\hat{i} + 10\,\hat{j}$, what is the **magnitude and direction** of $\vec{C} = 2\vec{A} - \vec{B}$?

$\vec{C} = 2\vec{A} - \vec{B}$

$= 2(12\hat{i} - 16\hat{j}) - (-24\hat{i} + 10\hat{j})$

$= 24\hat{i} - 32\hat{j} + 24\hat{i} - 10\hat{j}$

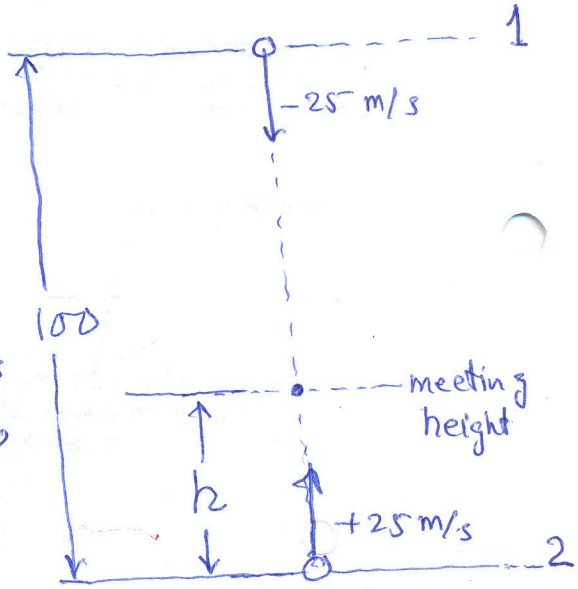
$\vec{C} = 48\,\hat{i} - 42\,\hat{j}$ (1)

$C = \sqrt{(48)^2 + (-42)^2} = \sqrt{4068} = 63.78$ (1/2)

$\tan\theta = \frac{-42}{48} = -0.875$

$\Rightarrow \theta = -41.2^\circ$ or $\theta = 318.8^\circ$ (1/2)

10. Two stones are thrown **at the same time** with **the same initial speed** of 25 m/s. The first stone is thrown **upward** from the ground while the other is thrown **downward** from the top of tower of a height of 100 m. At what distance above ground will the two stones meet ?



For stone 1:

$y_0 = 100$ m, $y = h$, $v_0 = -25$ m/s

$y = y_0 + v_0 t - \frac{1}{2} g t^2$

$h = 100 - 25t - 5t^2$ (1) (1/2)

For stone 2:

$y_0 = 0$, $y = h$, $v_0 = +25$ m/s

$h = 0 + 25t - 5t^2$ (2) (1/2)

Combine (1) and (2)

$100 - 25t - 5t^2 = 25t - 5t^2$

$100 = 50t$

$\Rightarrow t = 2$ s. (1/2)

From (2)

$\Rightarrow h = 25 \times 2 - 5(2)^2 = 30$ m. (1/2)

The Hashemite University
Department of Physics

General Physics I (2102101) **First Exam**
First Semester

Student's Name: ----------
Student's Number: ----------
Instructor's Name: ----------

NOTE: THE ACCELERATION DUE TO GRAVITY g = 10 m/s^2

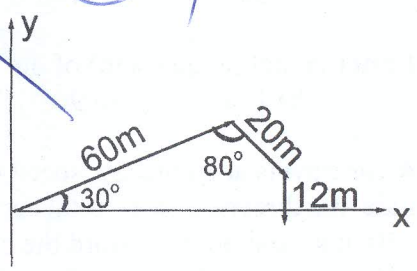
Circle the correct answer for each of the following questions.

Q1) The acceleration of an object as a function of its speed is given by $a = k_1 - k_2 v^2$. The dimensions of k_1 and k_2, respectively, are:

a) dimensionless; $\frac{1}{L}$ b) $\frac{1}{L}; \frac{L}{T^2}$ c) $\frac{L}{T^2}; L$ d) $\frac{L}{T^2}; \frac{1}{L}$ e) $\frac{T^2}{L^2}; \frac{L}{T^2}$

Q2) An object undergoes three successive displacements as shown below. The magnitude of its resultant displacement (in m) is: (note: the figure is not to scale).

a) 58.8 b) 38.6
c) 61.8 d) 42.8 e) 80.6

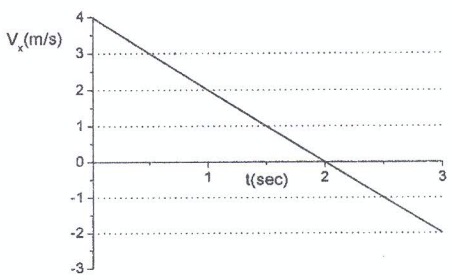


Q3) If $\vec{A} = (15, 80°)$ and $\vec{B} = 12\hat{i} - 16\hat{j}$, what is the magnitude of $\vec{A} - \vec{B}$?

a) 14.6 b) 35.4 c) 32.2 d) 5.8 e) 23.7

Q4) The velocity of a particle moving along the x-axis as a function of time is shown. If x = 2m at t = 1 sec., what is the position of the particle at t = 2 sec.

a) -3 b) -4.5 c) 3
d) 1 e) 4.5



Q5) An object moving with constant acceleration along the x-axis goes from $x = 10\text{m}$ to $x = 50\text{m}$ in 2.0 sec. The velocity at the end of this time interval is 10m/s. The acceleration (in m/s^2) of this object is:

a) 10 b) -2.2 c) 2.2 d) -10 e) -5

Q6) A stone is thrown vertically upward with an initial speed of 20m/s. Its time of flight (in sec) is:

a) 2 b) 4 c) 6 d) 8 e) 10

Q7) An object starts from the origin at $t = 0$ with a velocity of $2\hat{j}$ m/s and moves in the xy-plane with a constant acceleration of $\left(4\hat{i} + 2\hat{j}\right)\text{m/s}^2$. What is the y-coordinate of the object at the instant its x-coordinate is 18m?

a) 6 b) 35 c) 44 d) 9 e) 15

Q8) A ball is thrown horizontally from the top of a building 45m high with an initial speed of 30m/s. The magnitude of the instantaneous velocity (in m/s) of the ball at $t = 2\,\text{sec}$ is:

a) 45 b) 36 c) 10 d) 32 e) 20

Q9) The horizontal range (in m) of the ball in the previous problem is:

a) 60 b) 170 c) 90 d) 120 e) 80

Q10) A car travels at a constant speed of 20m/s along a circular track of radius 40m. The magnitude and direction of the total acceleration of the car are:

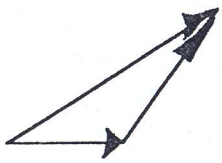
a) $10\ \text{m/s}^2$ and points toward the center of the circular track.
b) $10\ \text{m/s}^2$ and points away from the center of the circular track.
c) $20\ \text{m/s}^2$ and points toward the center of the circular track.
d) $20\ \text{m/s}^2$ and points away from the center of the circular track.
e) can not be determined unless the tangential component of the acceleration is known.

GOOD LUCK

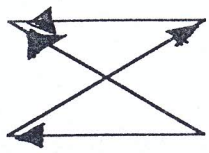
Q.1) If $\vec{A} = 12\,\hat{i} - 16\,\hat{j}$ and $\vec{B} = -24\,\hat{i} + 10\,\hat{j}$, what is the magnitude of the vector $\vec{C} = \vec{A} - 2\vec{B}$:

a) 42 b) 22 c) 64 d) 90 e) 70

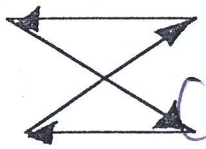
Q.2) Which of the following vector diagrams represents zero resultant ?



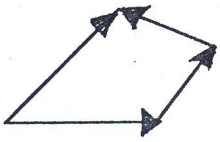
(a)



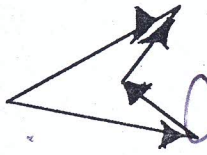
(b)



(c)

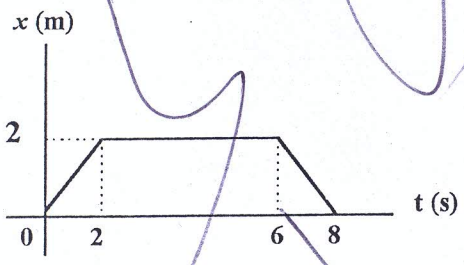


(d)



(e)

Q.3) In the following diagram , the total **distance** covered **(m)** in the time interval **0 - 8 s** is :



a) 2 b) 8 c) 6 d) 4 e) 12

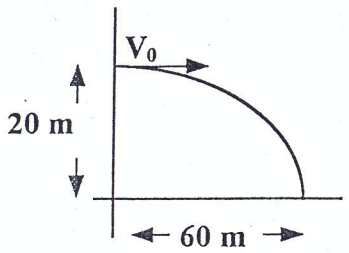
Q.4) A ball is released from rest . The magnitude of the average velocity **(m/s)** between the **2nd** and **4th** seconds of its fall is :

a) 30 b) 10 c) 40 d) 20 e) 70

Q.5) A body moves along a straight line . Its position at any instant is given by the equation $x = 3t^2 - \frac{8}{3}t^3$, where x in meters and t in seconds . The time or times **(s)** at which the body is at rest is :

a) 0 and 0.75 b) 0 c) 4 d) 0.75 e) 2

Q.6) In the figure shown , a stone is thrown horizontally with an initial speed v_0 from the top of a **20 m** high building . The stone lands **60 m** from the base of the building . **Find** the magnitude of the initial velocity **(m/s)** :

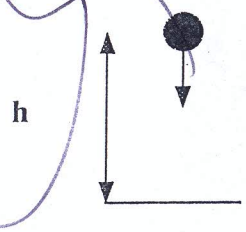


a) 15 b) 40 (c) 30 d) 55 e) 60

Q.7) A ball **A** is dropped from rest , at the same time another ball **B** is thrown horizontally . If both balls leave from the same height above the ground , then

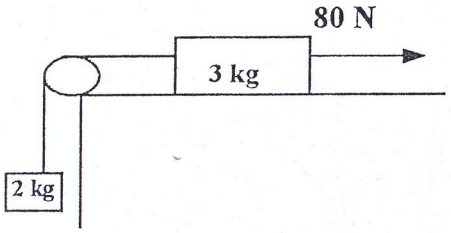
a) ball **B** hits the ground before ball **A** does .
(b) both balls hit the ground at the same time .
c) ball **A** hits the ground before ball **B** does .
d) the time can not be considered to compare the two motions .
e) not enough information is given to compare when they hit .

Q.8) A stone is thrown **downward** from an unknown height above the ground with an initial speed of **10 m/s** . It strikes the ground **1 s** later . Determine the initial height **(m)** of the ston above the ground .



(a) 15 b) 45 c) 75 d) 30 e) 5

Q.9) In the figure shown all surfaces are frictionless . **Find** the acceleration (m/s^2) of the system .



a) 3 b) 20 c) 4 (d) 12 e) 8

Q.10) As a train rounds a sharp horizontal turn of radius 150 m, it slows down from **90 km/h** to **50 km/h** at constant deceleration rate in 4 **s**. The total acceleration (m/s^2) as the train reaches **50 km/h is**

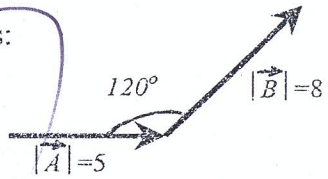
a) 1.5 b) 0.75 c) 1.3 d) 0.5 (e) 3

Q.1-Q.10 (1.5-Mark Each)

Q.1: The Cartesian coordinates of the point $(-3, 3\sqrt{3})$ in polar coordinates is:
(a) $(3, 60^\circ)$; *(b)* $(3, 120^\circ)$; *(c)* $(3\sqrt{3}, 60^\circ)$; *(d)* $(6, 60^\circ)$; *(e)* $(6, 120^\circ)$.

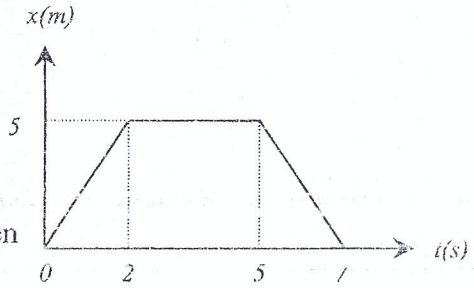
Q.2: If $\vec{A} = \hat{i} - 2\hat{j}$ and $\vec{B} = -3\hat{i} + \hat{j} + 2\hat{k}$, then $\vec{A} \bullet \vec{B}$ is:
(a) -5; *(b) 5;* *(c) 3;* *(d) 7;* *(e) 2.*

Q.3: In the figure shown beside, the value of $\vec{A} \bullet \vec{B}$ is:
(a) -20; *(b) 20;* *(c)* $-20\sqrt{3}$; *(d)* $20\sqrt{3}$; *(e) zero.*



Q.4: The angle between the vector: $\vec{r} = 2\hat{i} - \hat{j} - 3\hat{k}$ and the positive y-axis is:
(a) 105.5°; *(b) 74.5°;* *(c) 30.7°;* *(d) 58.3°;* *(e) 131.5°.*

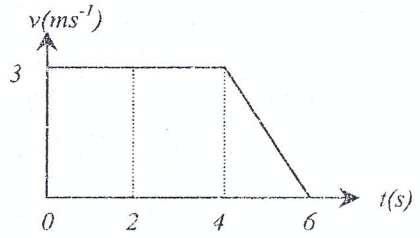
Q.5 & Q.6: Refer to the graph shown beside,



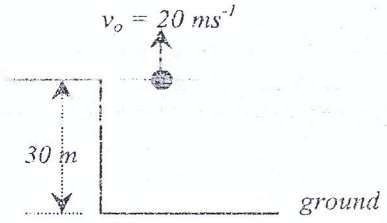
Q.5: The total distance *(in m)* traveled between $t = 0$ *s* and $t = 6$ *s* is:
(a) Zero; *(b) 25;* *(c) 15;*
(d) 10; *(e) 5.*

Q.6: The velocity during the time interval between $t = 0$ *s* and $t = 2$ *s* is:
(a) Constant; *(b) Increasing;* *(c) Decreasing;*
(d) Zero; *(e) Cannot be determined.*

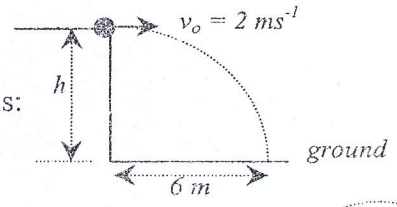
Q.7: The graph shown beside represents the velocity of a particle as a function of time. The acceleration *(in* $m.s^{-2}$*)* of the particle at $t = 5$ *s* is:
(a) 1.8; *(b) 2.6;* *(c) 3.0;*
(d) -1.5; *(e) -1.7.*



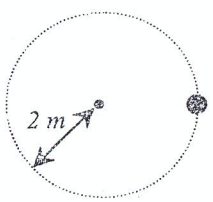
Q.8: A stone is thrown vertically upward as shown in the figure beside. The time *(in s)* needed for the stone to reach the ground is:
(a) 1.2; *(b) 3.1;* *(c) 5.2;*
(d) 4.3; *(e) 2.1.*



Q.9: In the figure shown beside, a ball is fired horizontally with a speed of 2 $m.s^{-1}$. The height, *h, (in m)* below the point of release is:
(a) 5; *(b) 30;* *(c) 10;*
(d) 45; *(e) 15.*



Q.10: In the figure shown, the particle completes one revolution in *2s* at a constant speed. The centripetal acceleration of the particle *(in* $m.s^{-2}$*)* is:
(a) 19.7; *(b) 1/2;* *(c) 1/4;* *(d) 4.9;* *(e) 9.9.*



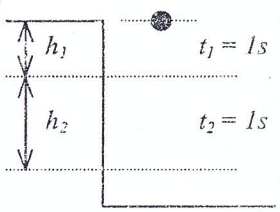
Q.11-Q.15 (2- Marks Each)

Q.11: The position of a car moving along the x-direction is given by: $x = 75t - t^3$, where x is in meters and t in seconds. The acceleration *(in $m.s^{-2}$)* when the car momentarily *(لحظيا)* stops is:

(a) -10; *(b) -30;* *(c) -60;* *(d) -75;* *(e) Zero.*

Q.12: A ball when released *(أطلقت)* from rest falls a distance h_1 meters during the first second of time. The distance of fall *(in m)* during the next second of time, *i.e.* h_2, is:

(a) 5; *(b) 10;* *(c) 15;*
(d) 20; *(e) 25.*

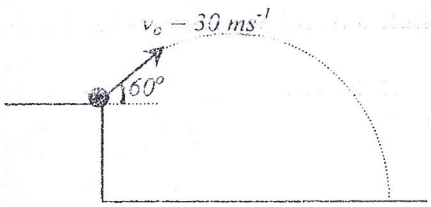


Q.13: The initial position and velocity of a particle are, respectively given by: $\vec{r}_o = 2\hat{i} + \hat{j}$, *in m,* and $\vec{v}_o = \hat{i} - 2\hat{j}$, *in* ms^{-1}. If the acceleration of the particle is $\vec{a} = -\hat{i} + \hat{j}$, *in* ms^{-2}, then the magnitude of the position vector *(in m)* at t=2*s* is:

(a) 5.0; *(b) 2.7;* *(c) 2.0;* *(d) 1.5;* *(e) 2.2 .*

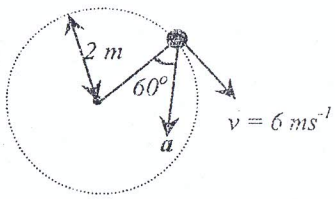
Q.14: In the figure shown beside, the speed *(in $m.s^{-1}$)* of the projectile after t = 5 *s* is:

(a) 15.0; *(b) 28.3;* *(c) 11.2;*
(d) 19.3; *(e) 24.0 .*



Q.15: A particle performs circular motion in a vertical plane. AT a certain instant the speed of the particle is 6 $m.s^{-1}$ and the direction of its total acceleration is as shown in the figure beside. The magnitude of the tangential acceleration *(in $m.s^{-2}$)* is:

(a) 14.7; *(b) 18.0;* *(c) 19.9;*
(d) 23.1; *(e) 31.2 .*



مع تمنياتنا للجميع بالتوفيق والنجاح

1- The coordinate of an object is given as a function of time by $x = 7t - 3t^3$, where x is in meters and t is in seconds. Its average velocity over the interval from $t = 0$ to $t = 2$ s is:

a) 5 m/s b) -5 m/s c) 11m/s d) -11 m/s e) -14 m/s

2- Starting at time $t=0$, an object moves along a straight line with velocity in m/s given by $v(t) = 98 - 2t^2$, where t is in seconds. When it momentarily stops its acceleration is:

a) 0 b) - 4.0 m/s^2 c) -9.8 m/s^2 d) -28 m/s^2
e) 49 m/s^2

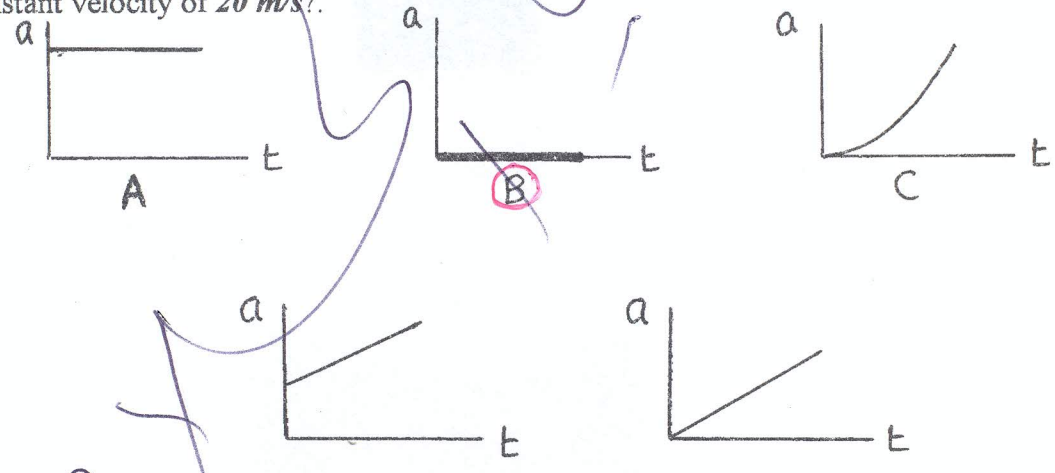
3- A stone is released from a balloon that is descending at a constant speed of 10 m/s. Neglecting air resistance, after 20 s the speed of the stone is :

a) 2160 m/s b) 1760 m/s c) 210 m/s d) 196 m/s
e) 186 m/s

4- An electric vehicle starts form rest and accelerates at a rate of **2.0 m/s^2** in a straight line until it reaches a speed of **20 m/s** . The vehicle then slows at a constant rate of **1.0 m/s^2** until it stops. The distance travelled from start to stop is:

a) 300 m b) 200 m c) 100 m d) 500 m
e) none of these

5- Which of the five following graphs is correct for an object moving in a straight line at a constant velocity of 20 m/s?.



6- If $|\vec{A} + \vec{B}| = A + B$ neither $\vec{A}$ nor $\vec{B}$ vanish and A > B , then:

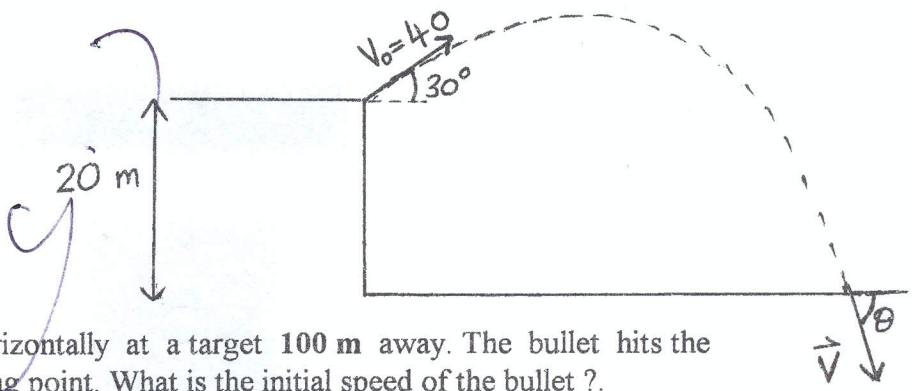
a) $\vec{A}$ and $\vec{B}$ are parallel and in the same direction
b) $\vec{A}$ and $\vec{B}$ are parallel and in opposite directions
c) the angle between $\vec{A}$ and $\vec{B}$ is 45°
d) the angle between $\vec{A}$ and $\vec{B}$ is 60°
e) $\vec{A}$ is perpendicular to $\vec{B}$

7- The angle between $\vec{A} = -25\hat{i} + 45\hat{j}$ and the positive x axis is :

a) 29° b) 61° c) 119° d) 151° e)209°

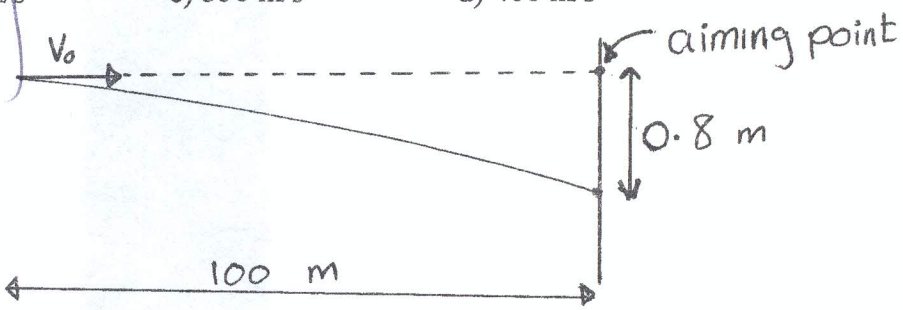
8- A stone is thrown from the top of a building 20 m high with an initial velocity of 40 m/s at 30° above the horizontal as shown . The angle θ ,as shown, which the velocity makes with horizontal just before the stone hits the ground is :

a) 20.1° b)39.2° c) 50° d) 55.3° e)25.9°



9- A rifle is aimed horizontally at a target **100 m** away. The bullet hits the target **0.8 m** below the aiming point. What is the initial speed of the bullet ?.

a) 250 m/s b) 100 m/s c) 350 m/s d) 400 m/s
e) 450 m/s



10- A stone is tied to a ***0.50 m*** string and whirled at a constant speed of ***4.0 m/s*** in a vertical circle. Its acceleration in m/s^2 at the top of the circle is:

a) 9.8 , up b) 9.8, down c) 8.0, down d) 32, up
e) 32, down

1. The coordinate of a particle in meters is given by

$x(t) = 12\,t - 1.5t^2$, where the time t is in seconds. The particle is momentarily at rest at t =

A) 2.o s B) 3.0 s C) 4.0 D) 5.0 s

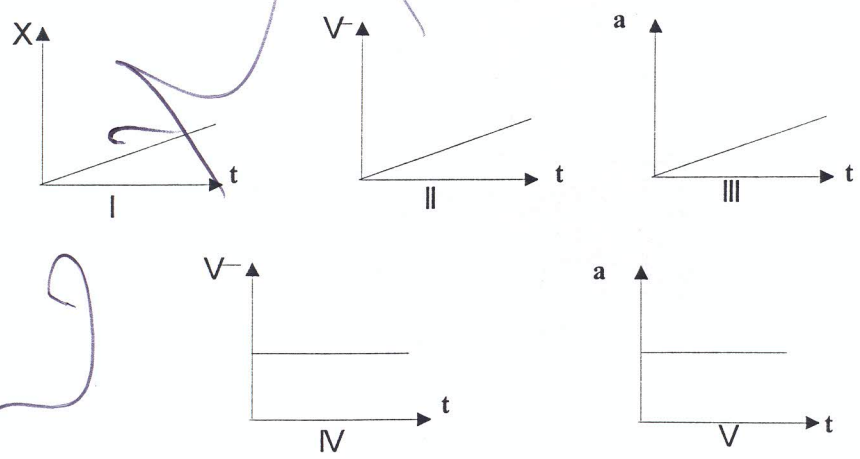
2. Over a short interval, starting at time t=o, the coordinate of an automobile in meters is given by $x(t) = 27t + 12t^2$, where t is in seconds. The magnitudes of the initial (at t = o) velocity and acceleration of the auto respectively are :

A) 0; 12 m/s^2
B) 0; 24 m/s^2
C) 27 m/s; 0
D) 27 m/s; 12 m/s^2
E) 27 m/s; 24m/s^2

3. An object is thrown straight up from ground level with a speed of 75 m/s. If g= 10 m/s^2 its distance above ground level 6.0 s later is :

A) 0.00 m
B) 270 m
C) 330 m
D) 480 m
E) None of these

4. Consider the following five graphs (note the axes carefully). Which of these represent (s) motion at constant speed?



A) IV only
B) I and II only
C) IV and V only
D) I and IV only
E) I, II, and III only

5. Four forces all have the same magnitude, F, oriented as shown . The resultant force is :

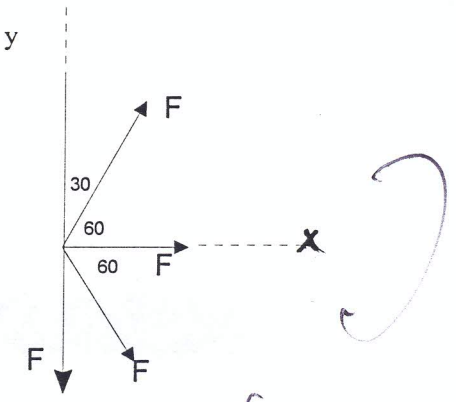
A) 3 F i+ F j

B) 2 F i+F j

C) $\sqrt{5}$ F i

D) F i+F j

E) 2 F i-F j



6. Let S = i + 2j + 2k and T = 3i + 4k . The angle between these two vectors is given by :

A) $\cos^{-1}(14/15)$

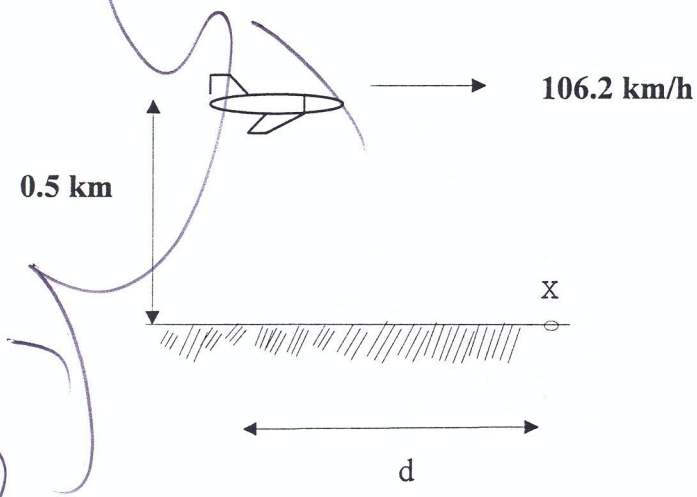
B) $\cos^{-1}(11/15)$

C) $\cos^{-1}(11/225)$

D) $\cos^{-1}(104/225)$

E) Cannot be found since S and T do not lie in the same plane .

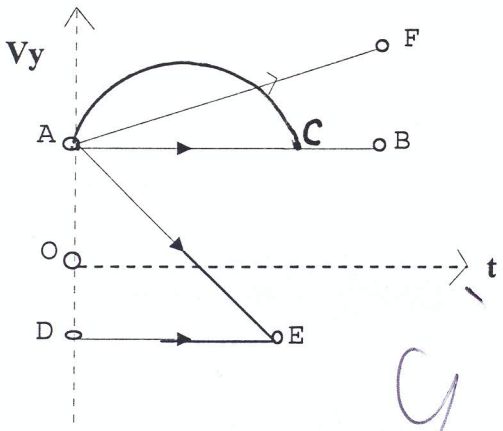
7. The airplane shown is in level flight at an altitude of 0.50 km and a speed of 106.2 km/h. At what distance d should it release a heavy bomb to hit the target X ? Take g = 10 m/s^2 .



A) 150 m B) 295 m C) 417 m

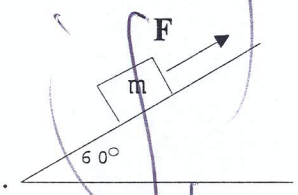
D) 2550 m E) 15000 m

8. Which of the curves on the graph below best represents v_y vs. t for a projectile fired at an angle of 45° above the horizontal ?



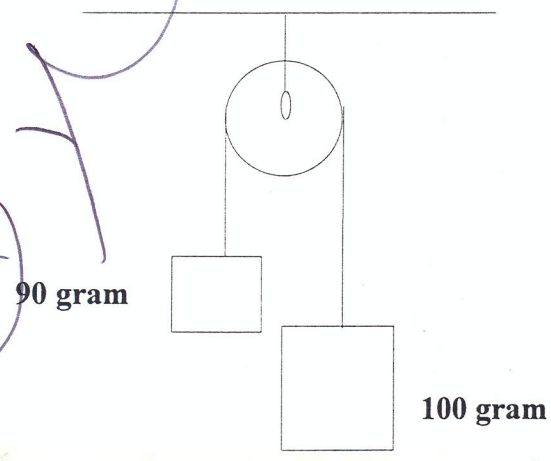
A) OC B) AB C) DE D) AF E) AE

9. A force (F=40N) is applied on a box of mass M as shown. The acceleration of the box was $2m/s^2$ up the smooth incline. The mass (in kg) of the box is:



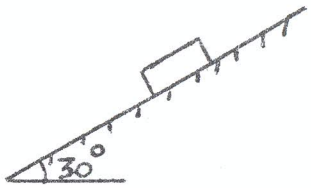
A) 3.75 B) 4.11 C) 5.71 D) 6.22 E) 10

10. Two blocks are connected by a string and pulley as shown. Assuming that the string an pully are massless, the magnitude of the acceleration of each block is :



A) $0.049\ m/s^2$
B) $0.020\ m/s^2$
C) $0.0098\ m/s^2$
D) $0.53\ m/s^2$
E) $1.00\ m/s^2$

Q1) A block is placed on a rough wooden plane . It is found that when the plane is tilted 30° to the horizontal , the block will slide down at constant speed . The coefficient of kinetic friction of the block with the plane is :



a) 0.866 b) 0.500 c) 1.730 d) 0.577 e) 1.455

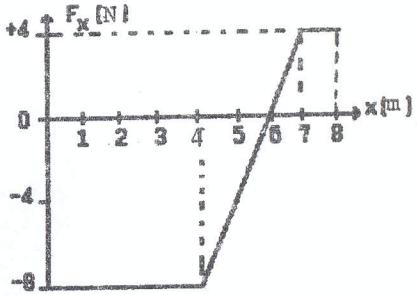
Q2) The force an ideal spring exerts on an object is given by $F_x = -kx$, where x measures the displacement of the object from its equilibrium ($x = 0$) position . If $k = 60$ N/m , then the work done (J) by this force as the object moves from $x = -0.20$ m to $x = 0$ is :

a) -1.2 b) -2.4 c) +2.4 d) +1.2 e) 0

Q3) At time $t = 0$ a 2-kg particle has a velocity in m/s of $4\hat{i} - 3\hat{j}$. At $t = 3$s its velocity in m/s is $2\hat{i} + 3\hat{j}$. During this time the work done (J) on it was :

a) -12 b) -4 c) 4 d) $(4\hat{i} + 36\hat{j})$ e) $6\hat{i}$

Q4) A body moving along the x-axis acted upon by a force F_x that varies with x as shown . The work done (J) by this force as the object moves from x = 1 m to x = 8 m is:

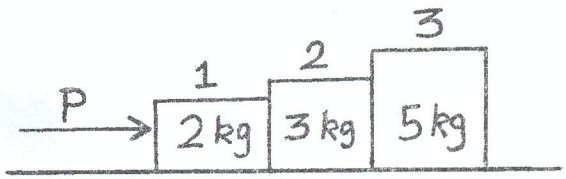


a) -2 b) -26 c) -10 d) -20 e) -18

Q5) An 8.0-kg object rests on the floor of an elevator which is accelerating downward at a rate of 1.5 $m.s^{-2}$. The magnitude of the force (Newten) the floor of the elevator exerts on the object is :

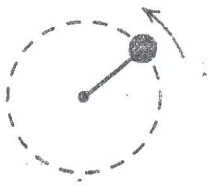
a) 90 b) 10 c) 59 d) 68 e) 105

Q6) If P = 6.0 N , What is the magnitude of the force (Newton) exerted on block (1) by block (2) ?



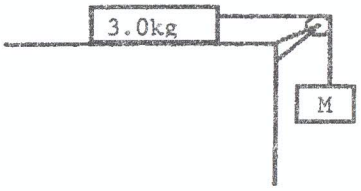
a) 6.4 b) 5.6 c) 4.8 d) 7.2 e) 3.2

Q7) The ball shown is being swung in a vertical circle at the end of a 6.4-m string . The minimum speed , in (m/s), with which the ball can go through its top position without having the string go slack is :



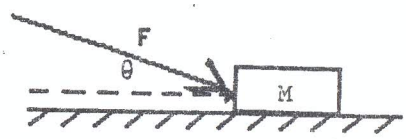
a) 4 b) 8 c) 12 d) 10 e) 6

Q8) The system shown is released from rest and moves 50 cm in 1.0 s . What is the value of M (kg) ? All surfaces are frictionless .



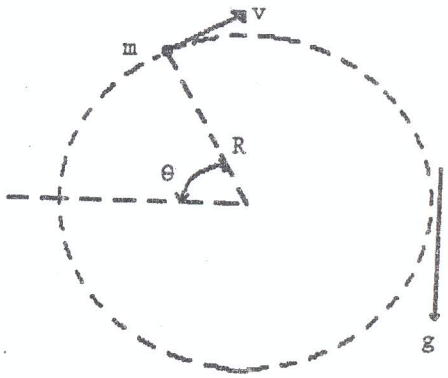
a) 0.33 b) 0.42 c) 0.50 d) 0.59 e) 0.67

Q9) A block is pushed across a horizontal surface by the force shown . If the coefficient of kinetic friction between the block and the surface is 0.30 , F = 20 N , θ = 30° , and M = 3.0 kg , then the magnitude of the acceleration (m/s^2) of the block is :



a) 2.8 b) 2.3 c) 1.8 d) 3.3 e) 3.7

Q10) A 0.30-kg mass attached to the end of a string swings in a vertical circle (R = 1.4 m) , as shown . At an instant when $\theta = 30°$, the speed of the mass is 6.0 m/s. The magnitude of the resultant force (N) on the mass at this instant is :



a) 5.71 b) 4.32 c) 6.45 d) 9.30 e) 8.14

❁ *GOOD LUCK* ❁

Course Title :
Course No. :

Instructor:

Mid-Term Examination

Time : One Hour

Student Name : ---------- Student No. : ----------

Answer All the Following Three Problems: (20 Points)

I. Multiple Choice: (8 points)

1. A stone is dropped from the top of a building. It reaches the ground with a speed of 37 m/s. The height of the building in meters is approximately:

   a) 2 b) 70 c) 6,800 d) 9.8 e) 100

2. A car accelerates from rest at a constant rate of 10 m/s^2. After 7 seconds, its speed in meters per second is:

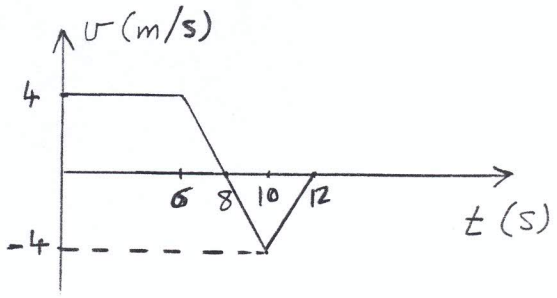
   a) 70 b) 2 c) 4,900 d) zero e) 10

3. A ball is thrown vertically upwards with an initial speed of v_i. It reaches the maximum height of 20 meters, then returns to the initial position. The displacement in meters is:

   a) v_i^2/g b) $v_i^2/(2g)$ c) 20 d) 40 e) zero

4. The velocity of an object moving along the x-axis is shown in the figure as a function of time. The distance travelled between t_i=0 and t_f= 12 seconds is given in meters as:

   a) 28 b) 20 c) 36 d) 8 e) zero



5. A car goes around a circle of radius 20 meters with a constant speed of 30 km/h. The car's acceleration in m/s^2 is approximately

   a) 45 b) 1.5 c) 3.5 d) .4 e) zero

II. Problem Two: (7 points)

a) In the equation,

$y^{\alpha} = ka^2t^{\beta}$, y is position, a is acceleration and t is time; k, α, β are dimensionless constants.

(i) Find the values of α, β that satisfy the dimensions of the equation. (3 points)

(ii) In the SI (MKS) system, what are the units of a^2 ? (1 point)

b) Vectors $\vec{A}$ and $\vec{B}$ are given by:

$\vec{A} = 3\hat{i} - 2\hat{j}$, $\vec{B} = -5\hat{i} + \hat{j}$

(i) Sketch $\vec{A}-\vec{B}$. (1 point)

(ii) Find the magnitude and direction of $\vec{A}-\vec{B}$. (2 points)