KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
EXAM: **PHYS101** FINAL EXAM (TERM:**952**) - TEST CODE NUMBER: 000

Problem No: 1
One gallon of paint (volume = $3.78*10^{-3}$ m^3) covers a wall of area $2*10^5$ cm^2. What is the thickness of the paint on the wall assuming that it is uniform ?
A. 0.189 mm. B. 0.458 mm. C. 0.326 mm.
D. 1.142 mm. E. 1.856 mm.
****

Problem No: 2
If vector B is added to vector A, the result is 6i+j. If vector B is subtracted from vector A, the result is -4i+7j. What is the magnitude of vector A ?
A. 4.12 B. 1.81 C. 2.24 D. 3.63 E. 5.40
****

Problem No: 3
A particle moving along the x axis has its position given by x = (24t - $2t^3$) m, where t is measured in s. How far is the particle from the origin (x=0) when it stops momentarily ?
A. 32 m. B. 0 m. C. 52 m. D. 60 m.
E. 15 m.
****

Problem No: 4
A particle moves along a circular path having a radius of 0.2 m. At an instant when the speed of the particle is equal to 3.0 m/s and is changing at the rate of 5.0 m/s^2, what is the magnitude of the total acceleration of the particle ?
A. 45.3 m/s^2. B. 12.2 m/s^2. C. 1.5 m/s^2.
D. 93.1 m/s^2. E. 28.3 m/s^2.
****

Problem No: 5
A block of mass M = 2.0 kg is pushed up a frictionless 30° incline by a force F = 14 N,
parallel to the incline, as shown in the **Figure.** What is the magnitude of the resulting acceleration of the block ?
I. 2.1 m/s^2. B. 3.5 m/s^2.
II. 1.1 m/s^2. D. 5.2 m/s^2.
E. 9.8 m/s^2.
****

Problem No: 6
A car goes over a circular hill of 200 m radius at a constant speed of 28 m/s. What is the force of the car seat on the 75 kg driver at the top of the hill?
A. 441 N, up. B. 302 N, up. C. 200 N, down.
D. 130 N, down. E. 754 N, up.
****

Problem No: 7
A spring (k = 600 N/m) is placed in a vertical position with its lower end supported by a horizontal surface as shown in the **Figure**. The upper end is compressed 20 cm, and a 4.0 kg block is placed on the compressed spring. The system is then released from rest. How far above the point of release will the block rise?
A. 30.6 cm. B. 41.8 cm. C. 82.1 cm.
D. 55.0 cm. E. 72.5 cm.
****

Problem No: 8
A 2.4 kg ball falling vertically hits the floor with a speed of 2.5 m/s and rebounds with a speed of 1.5 m/s. What is the magnitude of the impulse exerted on the ball by the floor?
A. 9.6 N*s. B. 2.4 N*s. C. 6.4 N*s.
D. 1.6 N*s. E. 0.0 N*s.
****

Problem No: 9
A 2.0 kg object moving at 5.0 m/s in the positive x direction makes a one dimensional elastic collision with a 2.0 kg object moving at 1.0 m/s in the same direction. Find the ratio of the total initial kinetic energy to the total final kinetic energy?
A. 1.0 B. 0.1 C. 2.1 D. 3.4
E. 0.0
****

Problem No: 10
The turntable of a record player has an angular velocity of 8.0 rad/s when it is turned off. The turntable comes to rest after 2.5 s. Through how many radians does the turntable rotate after being turned off? Assume a constant angular acceleration.
A. 10 rad. B. 8 rad. C. 14 rad.
D. 26 rad. E. 34 rad.
****

Problem No: 11
A 2-kg particle moves in the xy plane with a constant speed of 3 m/s along the line
y = 5 m parallel to the x-axis. What is the magnitude of its angular momentum
(in kg*m^2/s) relative to the origin?
A. 30. B. 20. C. 10. D. 50. E. 70.
****

Problem No: 12
A uniform beam having a mass of 20 kg and a length of 12 m is supported by a pin and a horizontal cable as shown in the **Figure**. What is the magnitude of the force of the pin on the beam ?
A. 259 N. B. 152 N. C. 110 N.
D. 393 N. E. 520 N.

Problem No: 13
A 5-kg mass attached to a spring executes a simple harmonic motion with a period
of 2.0 s. If the total energy of the system is 10 J, the amplitude of oscillation (in m) is
A. 0.637 B. 0.365 C. 0.132
D. 1.240 E. 2.113
****

Problem No: 14
A 0.4-kg mass attached to a spring of force constant 40 N/m vibrates with a simple harmonic motion of amplitude 10 cm. Calculate the shortest time that is taken by the mass to move from x = 0 to x = 10 cm.
A. 0.157 s. B. 1.571 s. C. 0.753 s.
D. 1.820 s. E. 1.023 s.
****

Problem No: 15
A uniform rod of length L = 1 m and mass m = 2 kg is suspended in a vertical position from a pivot a distance d = 0.25 m above its center of mass. The period of small oscillations of this pendulum is (I_c(rod) = (1/12) m*L^2)
A. 1.53 s. B. 2.72 s. C. 3.50 s.
D. 0.21 s. E. 0.93 s.
****

Problem No: 16
Three 4 kg masses are located in the xy plane as shown in the **Figure**. What is the magnitude of the resultant force (caused by the other two masses) on the mass at the origin ? (G = $6.67*10^{-11}$ N*m^2/kg^2)
I. $1.5*10^{-9}$ N B. $2.0*10^{-9}$ N
C. $3.9*10^{-9}$ N D. $1.2*10^{-9}$ NE.
****

Problem No: 17
A spaceship of mass m circles a planet of mass M in an orbit of radius R. How much energy is required to transfer the spaceship to a circular orbit of radius 3R ?
A. GmM / (3R). B. GmM / (2R). C. GmM / (4R). D. GmM / (6R).
****

Problem No: 18
A swimming pool of dimensions 30.0 m by 10.0 m has a flat horizontal bottom. When the pool is filled to a depth of 2.0 m with fresh water, what is the total force on the bottom surface of this swimming pool ? (assume the density of water to be 10^3 kg/m^3 and Pa = $1.01*10^5$ N/m^2)
A. $3.6*10^7$ N. B. $1.4*10^7$ N. C. $6.2*10^6$ N.
D. $2.1*10^6$ N. E. $3.8*10^5$ N.
****

Problem No: 19
Consider an ice cube of 10 cm side and average density of 917 kg/m^3. What is the magnitude of the minimum force that one has to exert on its

top surface to hold it completely submerged under water ? (the density of water 10^3 kg/m^3)

A. 0.813 N. B. 0.216 N. C. 0.124 N.
D. 1.280 N. E. 2.804 N.

****

Problem No: 20

A 2-cm diameter faucet is observed to fill a 0.1 m^3 container in 50 seconds. What is the speed at which the water leaves the faucet ? (assume the speed to be constant)

A. 6.37 m/s. B. 2.85 m/s. C. 1.76 m/s.
D. 5.09 m/s. E. 3.20 m/s.

****

Problem No: 21

If you push a 100 kg box at a constant speed of 2 m/s across a horizontal floor ($\mu = 0.5$), what is the power delivered to the box ?

A. 980 W. B. 120 W. C. 420 W.
D. 1300 W. E. 6200 W.

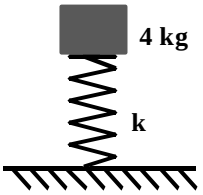
****

Problem No: 22

The moon is 384400 km distant from the earth's center (note that this distance is about 60 times the radius of the earth).
Find the moon's acceleration due to the gravitational force of the earth (the mass of the earth is $5.98*10^{24}$ kg and $G = 6.67*10^{-11}$ $N*m^2/kg^2$) .

A. $2.7*10^{-3}$ m/s^2. B. 9.8m/s^2. C. 1.63m/s^2.
D. $9.8*10^{-3}$ m/s^2. E. $5.4*10^{-3}$ m/s^2.

****



Problem No: 23

Determine the total kinetic energy of a sphere of mass M and radius R rolling without slipping on a horizontal
surface and whose center of mass moves with a speed v. ($I_c(sphere)=(2/5)*M*R^2$)

A. $(7/10)*M*v^2$. B. $(2/5)*M*v^2$. C. $(1/2)*M*v^2$.
D. $(5/7)*M*v^2$. E. $M*v^2$.

****

Problem No: 24

A mechanic pushes a 2000-kg car from rest to a speed v doing 4000 J of work in the process. Neglecting the work of frictional forces what is the final speed, v, of the car ?

A. 2 m/s. B. 8 m/s. C. 6 m/s. D. 5 m/s. E. 3 m/s.

****

Problem No: 25

A 1-kg mass attached to a 1-m long light string rotates in a circular motion on a horizontal, frictionless table. Find the work done by the tension during one complete revolution.

A. 0.0 J. B. 61.6 J. C. 30.4 J. D. 9.8 J. E. 19.6 J.