Exam 3-022

Q1 In landing, a jet plane decelerates uniformly and comes to a stop in 30 s, covering a distance of 1500 m along the runway. What was the jet's landing speed when it first touched the runway?

A1: 100 m/s
A2: 39 m/s
A3: 21 m/s
A4: 170 m/s
A5: 19 m/s

Q2 A projectile is fired with an initial velocity of 49 m/s at an angle of 30 degrees above the horizontal. If air resistance is negligible, how much time elapses before the projectile reaches its maximum height?

A1: 2.5 s
A2: 6.4 s
A3: 5.0 s
A4: 3.2 s
A5: 4.5 s

Q3 Earth has a mass of 5.98 x 10**24 kg. The average mass of the atoms that make up Earth is 40 u (1 u (atomic mass units) = 1.66 x 10**-27 kg). How many atoms are there in Earth?

A1: 9.0 x 10**49
A2: 1.5 x 10**50
A3: 3.6 x 10**51
A4: 9.9 x 10**50
A5: 6.6 x 10**49

Q4 The angle the vector 2.50 j + 4.33 k makes with the y axis is:

A1: 60 degrees
A2: 30 degrees
A3: 0 degrees
A4: 90 degrees
A5: 45 degrees

Q5 A crane lifts a 3900 kg shipping container through a vertical height of 4.5 m in 8.0 s. What is the average power that the crane motor must supply? Assume the crane to be moving with constant velocity and ignore friction.

A1: 2.1 x 10**4 W
A2: 7.7 x 10**4 W
A3: 2.7 x 10**3 W
A4: 1.7 x 10**3 W
A5: 5.7 x 10**5 W

Q6 A student applies a horizontal 20 N force to move a crate at a constant velocity of 4.0 m/s across a rough floor. How much net work is done on the crate in 6.0 s?

A1: 0   J
A2: 480 J
A3: 80 J
A4: 120 J
A5: 240 J

Q7 A block of mass m sliding down a rough incline (coefficient of kinetic friction u) at constant speed is initially at a height h as shown in Fig. 1. What is the increase in thermal energy of the block-incline system when the block reaches the bottom?

A1: mgh
A2: mgh/u
A3: umgh/sin(theta)
A4: mgh cos(theta)
A5: 0

Q8 Calculate the rotational inertia of a 0.56 kg meter stick about an axis perpendicular to the stick and located at the 80 cm mark. (Treat the stick as a thin rod).

A1: 9.7 x 10**-2 kg.m**2
A2: 4.7 x 10**-2 kg.m**2
A3: 6.5 x 10**-2 kg.m**2
A4: 3.8 x 10**-2 kg.m**2
A5: 1.7 x 10**-2 kg.m**2

Q9 A 1.0 m massless rod with a mass m1 = 100 g at the lower end is pivoted at O. The rod is at rest when a mass m2 = 100 g moving with velocity Vo strikes the top end and stick to it (see Fig.2). If the angular velocity of the system just after this collision is 32 rad/s, find Vo.

A1: 32 m/s
A2: 15 m/s
A3: 18 m/s
A4: 24 m/s
A5: 10 m/s

Q10 A uniform solid sphere is rolling smoothly up a ramp that is inclined at 10 degrees. What is the acceleration of its center of mass?

A1: 1.2 m/s**2 down the ramp
A2: 2.5 m/s**2 up the ramp
A3: 0
A4: 3.5 m/s**2 up the ramp
A5: 3.5 m/s**2 down the ramp

Q11 A particle of mass M moving with Vo=(5 i) m/s explodes into three equal mass particles. The first particle moves with V1 = (3 i) m/s, and the second particle moves with V2 =(3 j) m/s.
Find the velocity of the third particle.

A1: (12 i - 3 j) m/s
A2: (3 i + 3 j) m/s
A3: (-5 i + j) m/s
A4: (10 i - 2 j) m/s
A5: (-9 i - 3 j) m/s

Q12 A 3.0-kg ball with an initial velocity of (3i+2j) m/s collides with a wall and rebounds with a velocity of (-3i+2j) m/s. what is the impulse exerted on the ball by the wall?

A1: (-18i) N.s
A2: (+18i) N.s
A3: (-12j) N.s
A4: (+12j) N.s
A5: (+9i) N.s

Q13 A particle A of mass M and initial kinetic energy K has an elastic head-on collision with a particle B of the same mass M initially at rest. The kinetic energy of the particle A Q0 after collision is:

A1: 0
A2: K/2
A3: K
A4: K/SQRT(2)
A5: K/4

Q14 A uniform 50-kg beam is held in a vertical position by a pin at its lower end and a cable at its upper end. A horizontal force F = 75 N acts as shown in the figure. What is the tension in the cable?

A1: 54 N
A2: 69 N
A3: 47 N
A4: 61 N
A5: 75 N

Q15 A horizontal uniform meter stick is supported at the 50-cm mark. Q0 A mass of 0.50 kg is hanging from it at the 20-cm mark and a 0.30 kg mass is hanging from it at the 60-cm mark (see Fig.7). Determine the position on the meter stick at which one would hang a third mass of 0.60 kg to keep the meter stick balanced.

A1: 70 cm
A2: 74 cm
A3: 65 cm
A4: 86 cm
A5: 62 cm

Q16 A 20-m long steel wire (cross-sectional area 1.0 cm**2, Young's modulus 2.0 x 10**11 N/m), is subjected to a force of 25000 N.
How much will the wire be stretched?

A1: 2.5 cm
A2: 0.25 cm
A3: 12 cm
A4: 25 cm
A5: 1.2 cm

Q17 A satellite circles a planet (mass M = 5.0x10**24 kg) every 98 min. What is the radius of the orbit?

A1: 6.6 x 10**6 m
A2: 7.8 x 10**6 m
A3: 7.4 x 10**6 m
A4: 1.3 x 10**7 m
A5: 8.1 x 10**6 m

Q18 Three 5.0 kg masses are located at points in the xy plane as shown in the Fig.4. What is the magnitude of the resultant force caused by the other two masses on the mass at the origin?

A1: 2.1x10**(-8) N
A2: 2.7x10**(-8) N
A3: 1.8x10**(-8) N
A4: 2.4x10**(-8) N
A5: 2.9x10**(-8) N

Q19 A rocket is fired vertically from the surface of a planet (mass = M, radius = R). What is the initial speed of the rocket if its maximum height above the surface of the planet is 2R? (Assume there is no air resistance)

A1: SQRT(4GM/3R)
A2: SQRT(8GM/5R)
A3: SQRT(3GM/2R)
A4: SQRT(5GM/3R)
A5: SQRT(GM/3R)

Q20 A spaceship (mass = m) orbits a planet (mass = M) in a circular orbit (radius = R). What is the minimum energy required to make the spaceship escape the gravitational force of the planet?

A1: GmM/(2R)
A2: GmM/R
A3: GmM/(3R)
A4: 2GmM/(5R)
A5: GmM/(4R)

Q21 A 12-kg crate rests on a horizontal surface and a boy pulls on it with a force that is 30 deg. above the horizontal. If the coefficient of static friction is 0.40, the minimum force he needs to start the crate moving has a magnitude of:

A1: 44 N
A2: 47 N
A3: 54 N
A4: 56 N
A5: 71 N

Q22 The density of water and oil are 1.0 g/cm**3 and 0.80 g/cm**3 respectively. The height h of the column of oil, shown in Fig.5, is:

A1: 10 cm
A2: 4.6 cm
A3: 8.0 cm
A4: 2.0 cm
A5: 12 cm

Q23 An incompressible ideal liquid flows along the pipe as shown in Fig.6. The ratio of the speeds v2/v1 is:

A1: A1/A2
A2: A2/A1
A3: (A1/A2)**2
A4: (A1/A2)**0.5
A5: v1/v2

Q24 Bernoulli's equation can be derived from the conservation of:

A1: energy
A2: mass
A3: angular momentum
A4: volume
A5: pressure

Q25 A liquid of density 791 kg/m**3 flows smoothly through a horizontal pipe (see Fig. 6). The area A2 equals A1/2. The pressure difference between the wide and the narrow sections of Q0 the pipe (P1-P2) is 4120 Pa. What is the speed v1?

A1: 1.86 m/s
A2: 2.91 m/s
A3: 4.50 m/s
A4: 5.21 m/s
A5: 0.19 m/s

Q26 A 3-kg block, attached to a spring, executes simple harmonic motion according to x = 2*cos(50*t) where x is in meters and t is in seconds. The spring constant of the spring is:

A1: 7500 N/m
A2: 100 N/m
A3: 150 N/m
A4: 1.0 N/m
A5: 2100 N/m

Q27 Mass m oscillating on the end of a spring with spring constant k has amplitude A. Its maximum speed is:

A1: A*SQRT(k/m)
A2: (A**2)*k/m
A3: A*SQRT(m/k)
A4: A*m/k
A5: (A**2)*m/k

Q28 A 0.25-kg block oscillates on the end of the spring with a spring constant of 200 N/m. When t=0, the position and velocity of the block are x=0.15 m and v=3.0 m/s. What is the maximum speed of the block?

A1 5.2 m/s
A2 0.18 m/s
A3 3.7 m/s
A4 0.13 m/s
A5 13   m/s

Q29 An object undergoing simple harmonic motion takes 0.25 s to travel from one point of zero velocity to the next such point. The distance between those points is 40 cm. The amplitude and frequency of the motion are:

A1: 20 cm, 2 Hz
A2: 40 cm, 2 Hz
A3: 30 cm, 2 Hz
A4: 30 cm, 4 Hz
A5: 20 cm, 4 Hz

Q30 A 13-N weight and a 12-N weight are connected by a massless string over a massless, frictionless pulley. The 13-N weight has a downward acceleration equal to:

A1: g/25
A2: g/12
A3: g/13
A4: g
A5: (13g/25)

PHYS101 FINAL Exam Term-022

FIGURE-1

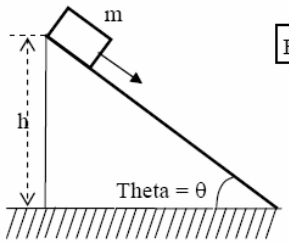

FIGURE-2

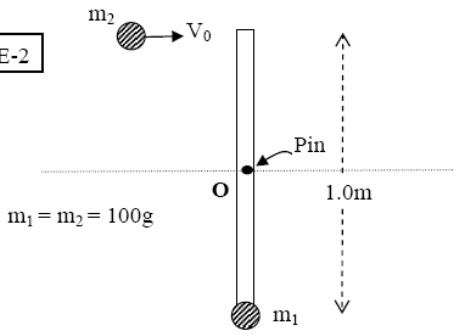

FIGURE-3

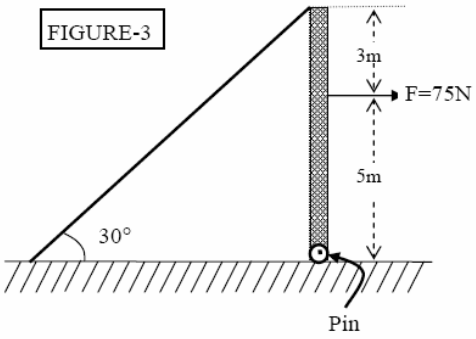

FIGURE-4

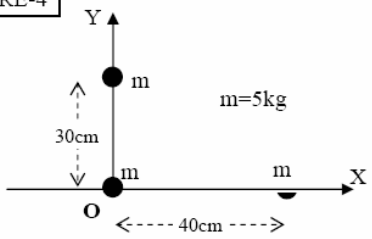

FIGURE-5

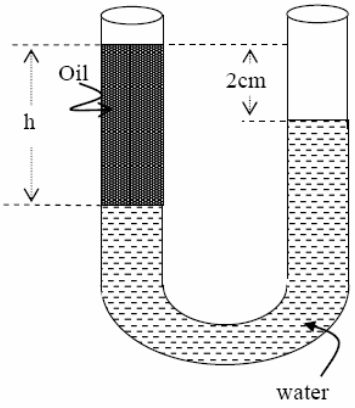

FIGURE-6

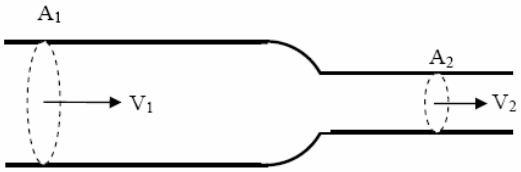

FIGURE-7