	TANTA UNIVERSITY- Faculty of Science -Department of Physics			
	FINAL TERM EXAM FOR SENIORS STUDENTS OF MATERIAL SCIENCE- 2 ND LEVEL			
	COURSE TITLE:	Mechanics		COURSE CODE: MS2131
DATE:	3 FEB. 2021	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED:120 MINS

Answer the following questions:

Please indicate your answers clearly in the space provided. Useful constants and conversion factors are provided ($g = 10 \text{ m/s}^2$).

Question 1

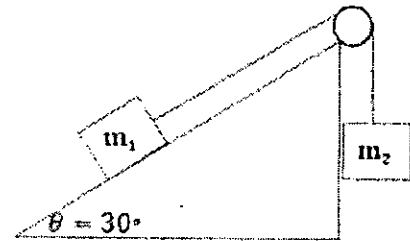
(20 marks)

- 1- A 1.0 kg object travelling at 1.0 m/s collides head on with a 2.0 kg object initially at rest. Find the velocity of each object after impact if the collision is perfectly elastic?
- 2- A ball of mass $m = 0.100 \text{ kg}$ is thrown straight up into the air with an initial speed of 15.0 m/s. Find momentum of the ball at halfway up of its maximum height?

Question 2

(25marks)

- 1- A block with mass $m_1 = 10 \text{ kg}$ rests on an inclined plane as shown in the figure. What is the mass m_2 must be attached to the cord in order to prevent the block from sliding down?
- 2- An object of mass 100 g travelling at 5.0 m/s enters a region of ice where the coefficient of kinetic friction is $\mu_k = 0.10$. By using the work-energy theorem to find the distance the object travels before coming to rest?



Question 3

(25 marks)

- 1- The position of a particle moving under uniform acceleration is function of time (t) and acceleration (a). If we write this equation as: $S = ka^m t^n$, where k is a dimensionless constant. Show by dimensional analysis that this expression is satisfied if $m=1$ and $n=2$, can this analysis give the value of k ?
- 2- The minimum distance required to stop a car moving at 35.0 (mil/hr) is 40.0 ft. What is the minimum stopping distance for the same car moving at 70.0 (mil/hr), assuming the same rate of acceleration?
- 3- A plane drops a package of emergency rations to a party of explorers. If the plane is traveling horizontally at 50.0 m/s and 100 m above the ground. Where does the package strike the ground relative to the point at which it is released?

Question 4**(30 marks)**

1- The SI base unit of impulse is:

- a) N.s b) N/s c) Kg.m/s d) a&c

2- If an electron (mass $m=9.11 \times 10^{-31}$ kg) in copper near the lowest possible temperature has a kinetic energy of 6.7×10^{-19} J. The speed of the electron is:

- a) 1.21×10^6 m/s b) 2.21×10^5 m/s c) 3.21×10^6 m/s d) 4.21×10^5 m/s

3- An object of mass 1g is whirled in a horizontal circle of radius 0.5 m at a constant speed of 2.0m/s. The work done on the object during one revolution is:

- a) 1 J b) 2 J c) 4 J d) 0 J

4- Graphically the resultant "magnitude and direction" of three vectors ($20m, 45^\circ$ & $25m, 300^\circ$ and $15m, 210^\circ$) are given by:

- a) $20.3m$ & 312° b) $15.1 m$ & 250° c) $10.2m$ & 220° d) $9.3m$ & 199°

5- (ALSO 6 and 7) A 3kg block starts from rest at the top of 30° incline fractional surface and slides a distance of $2m$ down the incline in 1.5 s. Then:

i- The acceleration of the block is :-

- a) 0.5 m/s^2 b) 1.20 m/s^2 c) 1.78 m/s^2 d) 2.45 m/s^2

6- The friction force acting on the block is,

- a) 5.40 N b) 9.66 N c) 13.4 N d) 15.3 N

7- The coefficient of kinetic friction between the block and the plane is:

- a) 0.12 b) 0.21 c) 0.29 d) 0.37

8- $1 \text{ rev.} = 360^\circ =$

- a) $2\pi \text{ rad}$ b) $3\pi \text{ rad}$ c) $4\pi \text{ rad}$ d) $\pi \text{ rad}$

9- The instantaneous tangential velocity vector is alwaysto the radius vector for circular motion.

- a) Parallel b) perpendicular c) inclined d) None of these

10- A wheel rotates with a constant angular acceleration of 3.50 rad/s^2 . If the angular speed of the wheel is 2.00 rad/s at $t_i = 0$. Through what angle does the wheel rotate in 2.00 s?:

- a) 5 rad b) 7 rad c) 9 rad d) 11 rad

EXAMINER

PROF. ALI IBRAHIM

 BEST WISHES 



TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

BIOPHYSICS		LEVEL 2	EXAMINER DR. AYMAN ELTAHAN
COURSE TITLE:	Classical Mechanics		COURSE CODE: MS 2131
DATE:30	JAN, 2021	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100
			TIME ALLOWED: 2 HOURS

Final Exam

Answer the following questions:

First question:

1- Choose the correct answer:

- I If two different masses moved in contact, then
(A) They will moved with a different acceleration and same force
(B) They will moved with the same acceleration and different forces
(C) They will moved with a different acceleration and different forces
(D) They will moved with the same acceleration and same force
-
- II Anybody moves under the effects of
(A) The force that the body exerts (B) The force acting on it (C) Both of A and B (D)Frictional force
-
- III Right Now you are at rest on a chair. Ignoring the rotation and orbit of the earth, what is your acceleration?
(A) zero (B) 9.8 m/s (C) 9.8 m/s² (D) 9.8 N
-
- IV A boy and a girl are riding on a rotating turntable that is turning at a constant rate. The boy is near the outer rim and the girl is closer to the center of rotation. How do their linear (that is, tangential) velocities compare?
(A) **Each** has a linear velocity of zero. (B) **Each** has a linear velocity of zero. (C) **Each** has a linear velocity of zero. (D) **Each** has a linear velocity of zero.
-
- V The velocity of object become constant, when
(A) **The** net force acting on it is equal to zero. (B) **The** acceleration is equal to zero (C) **Both** A and B (D) **None** of them.
-

- 2- An object of mass 20 kg is at rest. A net force of 10 N is applied for 5 s. what is the final velocity? How far will the object have moved in the 15 s interval?

Second question:

- 1- A block with a mass $m = 10$ kg rests on an inclined plane (30° with a horizontal). What mass M must be attached to the cord in order to prevent the block from sliding down?
- 2- Find an expression for the work kinetic energy theorem for rotational motion?
- 3- State the types of physical quantities and Newtonian mechanics.

Continue



Third question:

- 1- **Write short notes about:** The frictional force, impulse, inertia, parallel axis theorem and Kinetic energy.

- 2- A 0.250 kg puck, initially at rest on a horizontal, frictionless surface is struck by a 0.160 kg puck moving initially along the x axis at a speed of 2.60 m/s. After the collision, the 0.160 kg puck has a speed of 1.40 m/s at an angle of $q = 57.0^\circ$ to the positive x axis.
 - a) Determine the velocity of the 0.250 kg puck after the collision.
 - b) Find the fraction of kinetic energy loss in the collision.

- 3- **Correct the wrong if found;**
 - a) When a zero net torque τ acts on an object, the object gains angular acceleration.
 - b) Rate of angular momentum represented by the force.
 - c) The body size is a measure of its inertia.
 - d) The frictional force has the same direction of object motion.
 - e) The momenta of the individual objects in the system may change, so the vector sum of all the momenta will change also.

Fourth question:

- 1- A projectile object has initial velocity 10^5 m/s^2 at angle 60° with a horizontal, find
 - a) The maximum height of this projectile?
 - b) The horizontal distance when the projectile moves down at the same level of the start point?

- 2- **Complete the sentences:**
 - a) In ----- collision, momentum is conserved, kinetic energy is not, and the two objects stick together after the collision.
 - b) The magnitude of the linear velocity v of a point on the rolling object depends on ---.
 - c) A body remains in its state of rest or uniform motion in a straight line unless acted by -----.
 - d) When a cylinder rolls with slipping on a flat surface that is called-----.
 - e) According to Newton's second law the net force acting on an object of mass is related to the rate of

Best wishes



TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

EXAMINATION OF THERMODYNAMICS (SCOND YEAR) STUDENTS OF MATERIAL SCIENCE

COURSE TITLE: Thermodynamic of material

COURSE CODE MS 2141

DATE: 20-3-2021

TERM: 1

TOTAL ASSESSMENT MARKS: 150

TIME ALLOWED: 2 HOURS

Q1-Choose the correct answer (40)

1- What will be the work done by 3 moles of an ideal gas when it expands spontaneously in a vacuum? (a) zero (b) infinite (c) 3 joules (d) 9 joules

2- All mediums have (a) One specific heat (b) Two specific heats (c) Three specific heats (d) None

3- Integral of dQ/T is independent of reversible path connecting between two points.
a) true b) false

4- Entropy is a. a) path function, intensive property b) path function, extensive property c) point function, intensive property d) point function, extensive property

5- The entropy of an isolated system can never ____ a) increase b) decrease c) be zero d) none of the mentioned

6- The Gibbs function is defined as a- $G=U+PV+TS$ b- $G=U-PV-TS$
c- $G=U+PV-TS$ d- $G=U-PV+TS$

7- Work done on a system is taken to be a) positive b) negative c) zero
d) varies according to situation

8- Thermodynamic properties are a) point function b) path function c) depends on the state
d) none of the mentioned

9- For a process in which $pV=C$, work done is a) zero b) $p*(V_2-V_1)$ c)
 $p_1*V_1*\ln(V_2/V_1)$ d) none of the mentioned

10-A system in which even energy is not allowed to cross the boundary is called (a)
closed system (b)extensive system (c) isolated system (d)special system

11-The system in which there is a flow of mass is known as (a) equilibrium system
(b) isolated system (c) open system (d) closed system

12-The enthalpy $H=U+pV$ then which of the following relation hold true

(a) $\left(\frac{\partial H}{\partial S}\right)_P = T$, $\left(\frac{\partial H}{\partial P}\right)_S = V$ (b) $\left(\frac{\partial H}{\partial S}\right)_P = -T$, $\left(\frac{\partial H}{\partial P}\right)_S = V$

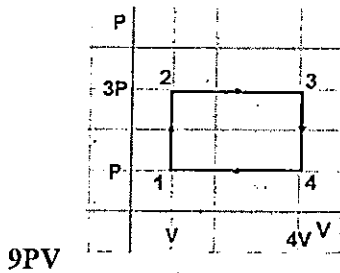
(c) $\left(\frac{\partial H}{\partial S}\right)_P = V$, $\left(\frac{\partial H}{\partial P}\right)_S = T$ (d) $\left(\frac{\partial H}{\partial S}\right)_P = V$, $\left(\frac{\partial H}{\partial P}\right)_S = -T$

13-The temperature of reservoir of Carnot's engine operating with an efficiency of 70% is 1000K. The temperature of its sink is— (A) 300 K (B) 400 K (C) 500 K

14- Internal energy of a perfect gas depends on:

- (a) Temperature only (b) Temperature and pressure
(c) Temperature, pressure and specific heats (d) None of the above

15- An ideal gas is taken through a closed path 1→2→3→4→1. What is the net work done by the gas? (A) 6PV (B) 9PV (C) 4PV (D) -6PV (E) -



Q2-a- Show that if F is known as a function of V and T,

$$H = F - T \left(\frac{\partial F}{\partial T} \right)_V - V \left(\frac{\partial F}{\partial V} \right)_T$$

b- Show that $C_p = \left(\frac{d^1 q}{dT} \right)_P = \left(\frac{\partial u}{\partial T} \right)_P + P \left(\frac{\partial V}{\partial T} \right)_P$

c- Show that $w = \frac{1}{1-\gamma} (p_2 v_2 - p_1 v_1)$ in an adiabatic process.

d- Drive the equation of entropy of ideal gas as a function of P and V. (50)

Q3 a - Calculate the work done by a steam of mass 0.01 kg at temperature 126° C, in an isothermal process of the initial and final volumes are 2X10-3 and 20X10-3m3

respectively. The state equation is given by $P=RT \left(\frac{1}{V} + \frac{B}{V^2} + \frac{C}{V^3} \right)$ B=-142.2X10-6 m3/mole C=-7140X10-12 m6/mole

b- At 27°C, two moles of an ideal monatomic gas occupy a volume V. The gas is adiabatically expanded to a volume 2V.

- (a) Calculate the ratio of final pressure to the initial pressure
(b) Calculate the final temperature
(c) Change in internal energy (30)

Q4 Write short notes : equation of state of real gas -----, Joule-Thomson experiment-----, Draw Carnot cycle in P,V and T,S diagrams----- . (30)

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