LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

FIRST SEMESTER – **APRIL 2023**

UPH 1301 – PHYSICS FOR MATHEMATICS

Date: 08-05-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

SECTION A

Answer ALL the Questions

1.	**Answer the following**		**(5 x 1 = 5)**
a)	Define angular acceleration.	K1	CO1
b)	State any one of Kepler's laws of planetary motion.	K1	CO1
c)	Write the S.I unit of elasticity.	K1	CO1
d)	What is a diode?	K1	CO1
e)	State any one postulate of special theory of relativity.	K1	CO1
2.	**Fill in the blanks**		**(5 x 1 = 5)**
a)	Average velocity can be calculated by dividing displacement with _____.	K1	CO1
b)	Newton's law of universal gravitation is given by _____.	K1	CO1
c)	The dimensions of surface tension is _____.	K1	CO1
d)	The most commonly used semiconductor is _____.	K1	CO1
e)	The speed of light is _____.	K1	CO1
3.	**MCQ**		**(5 x 1 = 5)**
a)	Speed of a car is 20 m/s. How much distance (in Km) will the car travel in 2.5 hours? 144 (b)72 (c) 180 (d) 108	K2	CO1
b)	What is the value of 'g'? 9.8 m/s^2 (b) 10.7 m/s^2 (c) 12.6 m/s^2 (d) 98 m/s^2	K2	CO1
c)	A bridge collapses when too many people stands on it because (a)Due to increase in stress (b)Due to overweight (c)Due to improper construction (d) Due to friction	K2	CO1
d)	When a pentavalent impurity is added to a pure semiconductor, it becomes a) An insulator (b) An intrinsic semiconductor (c) p-type semiconductor (d) n-type semiconductor	K2	CO1
e)	According to Einstein's Special Theory of Relativity, the laws of physics can be formulated for _____ (a) Inertial Frame of Reference (b) Non-Inertial Frame of Reference (c) Both Inertial and Non-Inertial Frame of Reference (d) Quantum State	K2	CO1
4.	**State whether True or False**		**(5 x 1 = 5)**
a)	Centripetal force is a force that makes a body follow a curved path.	K2	CO1
b)	When a missile is launched with a velocity less than the escape velocity the sum of its kinetic and potential energies is positive.	K2	CO1
c)	Surface energy is the extra energy that the molecules at the surface have	K2	CO1

	relative to molecules inside the liquid.		
d)	Silicon is used in the fabrication of LED.	K2	CO1
e)	An inertial reference frame is either at rest or moves with a constant velocity.	K2	CO1
	SECTION B		
Answer any TWO of the following in 100 words		**(2 x 10 = 20)**	
5.	Show that the escape velocity from the surface of the earth is 11.2 km/s.	K3	CO2
6.	What is a Zener diode? Explain the V-I characteristic of a Zener diode and discuss its application.	K3	CO2
7.	(a) Show that work done per unit volume in straining a body is equal to $\frac{1}{2} \times \times$ stress × strain. (b) What are inertial and non-inertial frames of reference? **(7+3 Marks)**	K3	CO2
8.	Discuss in detail the relativistic length – contraction and time dilation.	K3	CO2
	SECTION C		
Answer any TWO of the following in 100 words		**(2 x 10 = 20)**	
9.	Explain working of a spring-mass system under vertical and horizontal configurations.	K4	CO3
10.	Derive Poiseuille's formula for the rate of flow of a liquid through a capillary tube.	K4	CO3
11.	With neat circuit diagrams explain how AND, OR and NOT gates can be constructed using diodes and transistors.	K4	CO3
12.	Derive Einstein's mass energy relation.	K4	CO3
	SECTION D		
Answer any ONE of the following in 250 words		**(1 x 20 = 20)**	
13.	(a) What is Projectile motion? Deduce an expression for maximum height, horizontal range and time of flight for an object projected at an angle θ with respect to the horizontal in a uniform gravitational field. (b) Calculate the density of the earth and mass of the sun. **(12+8 marks)**	K5	CO4
14.	(a) Explain the extrinsic and intrinsic semiconductors with a neat energy band diagrams. (b) Derive an expression for the moment of the couple required to twist one end of a cylinder through an angle θ when the other is fixed**. (12+8 marks)**	K5	CO4
	SECTION E		
Answer any ONE of the following in 250 words		**(1 x 20 = 20)**	
15.	(a) With a neat diagram describe Michelson – Morley experiment and explain the physical significance of the negative results. (b) Derive Newton's law of gravitation from Kepler's law of planetary motion. **(13+7 marks)**	K6	CO5
16.	(a) Obtain an expression for the excess of pressure inside a spherical soap bubble and a spherical liquid drop. (b) With the required circuit diagrams, establish that NAND gate is a universal gate. Explain its working. **(10+10**	K6	CO5

	marks)		

$$$$$$$