

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**B.Sc. DEGREE EXAMINATION – MATHEMATICS**FIRST SEMESTER – **NOVEMBER 2022****UPH 1301 – PHYSICS FOR MATHEMATICS**

Date: 01-12-2022

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION – A**Answer ALL the Questions**

1.	Define the following.	(5 x 1 = 5)	
a)	Projectile motion	K1	CO1
b)	Gravitational potential	K1	CO1
c)	Inertial and non-inertial frames of reference	K1	CO1
d)	Poisson's ratio	K1	CO1
e)	Viscosity	K1	CO1
2.	Fill in the blanks	(5 x 1 = 5)	
a)	Kepler's second law of planetary motion is also called _____.	K1	CO1
b)	_____ and _____ are called universal gates.	K1	CO1
c)	The height of a projectile is equal to _____.	K1	CO1
d)	_____ transformation are replaced by the Lorentz transformation which confirms the postulate of relativity.	K1	CO1
e)	_____ type of impurity is added to form a P type semiconductor.	K1	CO1
3.	MCQ	(5 x 1 = 5)	
a)	In which one of the following, light energy is converted into electrical energy? (i)Light-emitting diode (ii) Laser diode (iii) solar cell (iv) transistor	K2	CO1
b)	The path of a projectile is called (i)coral (ii) orbit (iii) trajectory (iv) track	K2	CO1
c)	The ratio of linear stress to linear strain is called (i)Young's modulus (ii) bulk modulus (iii) rigidity modulus (iv) Poisson's ratio	K2	CO1
d)	Hooke's law is valid upto (i)Elastic limit (ii) upper yield point (iii) plastic limit (iv) lower yield point	K2	CO1
e)	Length contraction happens only (i)perpendicular to the direction of motion (ii) along the direction of motion (iii) parallel to the direction of motion (iv) both (i) and (ii)	K2	CO1
4.	State True or False	(5 x 1 = 5)	
a)	When a pentavalent impurity is added to a pure semiconductor it becomes an n- type semiconductor.	K2	CO1
b)	Mathematically displacement is dv/dt .	K2	CO1

c)	Moving clock runs faster.	K2	CO1
d)	Rain drops are spherical due to the force of surface tension.	K2	CO1
e)	The leakage current in a crystal diode is due to minority carriers.	K2	CO1
SECTION – B			
Answer any TWO of the following in 100 words			(2 x 10 = 20)
5.	Prove that oscillations of a spring mass system are simple harmonic. With a neat diagram explain the potential energy and kinetic energy variations in an oscillating system.	K3	CO2
6.	Derive an expression for the Poiseuille's formula for the flow of a liquid through a capillary tube.	K3	CO2
7.	Discuss in detail the intrinsic and extrinsic semiconductors and the conduction process in semiconductors.	K3	CO2
8.	Explain relativistic time dilation and length contraction.	K3	CO2
SECTION – C			
Answer any TWO of the following in 100 words			(2 x 10 = 20)
9.	Derive Einstein's mass-energy relation.	K4	CO3
10.	What is a logic gate? With neat circuit diagrams and relevant truth tables explain the construction and working of AND, OR and NOT gates. (1+ 3+ 3+ 3 Marks)	K4	CO3
11.	Define the three moduli of elasticity. Establish a relation between the same.	K4	CO3
12.	Explain in detail Boy's method of determining the gravitational constant.	K4	CO3
Answer any ONE of the following in 250 words			(1 x 20 = 20)
13.	(a) Using a neat diagram, describe the Michelson-Morley experiment. Explain the physical significance of the negative result. (14 Marks) (b) Discuss the principle of consistency of speed of light. (6 Marks)	K5	CO4
14.	(a) Explain the term parking orbit? Derive an expression for the potential energy and kinetic energy of a satellite in an orbit of radius 'r'. (10 Marks) (b) Define escape velocity. Show that the escape velocity from the surface of the earth is 11.2 km/sec. (10 Marks)	K5	CO4
SECTION – E			
Answer any ONE of the following in 250 words			(1 x 20 = 20)
15.	What is a junction diode? Analyse the working of a P-N junction diode under forward and reverse biasing. Draw the current-voltage characteristic curve for the junction diode	K6	CO5
16.	(a) Elucidate surface tension. Explain in detail the drop weight method of determining the surface tension of a liquid. (10 Marks) (b) With neat graphical representation discuss the variation of (i) distance with time (ii) velocity with time for a projectile in Earth's gravitational field. (10 Marks)	K6	CO5
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