LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

U.G. DEGREE EXAMINATION – **ALLIED**

FIRST SEMESTER – **NOVEMBER 2024**

UPH 1301 – PHYSICS FOR MATHEMATICS

Date: 20-11-2024 Dept. No. Max. : 100 Marks

Time: 09:00 am-12:00 pm

	SECTION A - K1 (CO1)	
	Answer ALL the Questions -	**(10 x 1 = 10)**
1.	Define **the following**	
a)	Inertial and non-inertial frames of reference.	
b)	Hooke's law.	
c)	Angle of contact.	
d)	Poisson's ratio.	
e)	Gravitation potential.	
2.	**Fill in the blanks**	
a)	_____is the length of an object in the object's rest frame.	
b)	Kepler's second law of planetary motion is also called _____.	
c)	Rain drops are spherical due to _____.	
d)	_____is the ratio of lateral strain to longitudinal strain .	
e)	_____ and _____ are called universal gates.	
	SECTION A - K2 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
3.	True or False	
a)	Mathematically displacement is $\frac{dv}{dt}$.	
b)	A temporary orbit used during the launch of a space craft is called parking orbit.	
c)	The resistance of a semiconductor is independent of temperature.	
d)	Moving clock runs faster.	
e)	Inertial frame of reference is also called accelerated frame of reference.	
4.	**MCQ**	
a)	Addition of a pentavalent impurity to a semiconductor creates an excess of (i) free electrons (ii)holes (iii) bound electrons (iv) none of the above	
b)	In which one of the following, light energy is converted into electrical energy? (i)Light-emitting diode (ii) Laser diode j (iii) solar cell (iv) transistor	
c)	The rise of a liquid inside a capillary tube is due to (i) surface tension (ii) osmosis (iii) diffusion (iv) none of the above	
d)	The path of a projectile is called (i) coral (ii) orbit (iii) trajectory (iv) track	
e)	The charge of a P-type semiconductor is _____ (i) positive (ii) negative (iii) neutral (iv) none of the given options	
	SECTION B - K3 (CO2)	
Answer any TWO of the following		**(2 x 10 = 20)**

5.	Derive Einstein's mass-energy relation.
6.	With a neat diagram, explain the construction and working of a light emitting diode.
7.	Explain in detail with a neat diagram the Boy's method of determining the gravitational constant. Obtain an expression for the same.
8.	Discuss in detail the intrinsic and extrinsic semiconductors and the conduction process in semiconductors.
	SECTION C – K4 (CO3)
Answer any TWO of the following	**(2 x 10 = 20)**
9.	Derive an expression for the Poiseuille's formula for the flow of a liquid through a capillary tube.
10.	Elucidate the concept of time dilation and length contraction and hence prove that (a) moving clocks appear to run slower and (b) moving objects appear contracted.
11.	Define the three moduli of elasticity. Establish a relation between the same.
12.	Illustrate with a neat circuit diagram the construction, working and I-V characteristics of a Zener diode.
	SECTION D – K5 (CO4)
Answer any ONE of the following	**(1 x 20 = 20)**
13.	(a) With neat circuit diagrams and relevant truth tables explain the construction and working of AND, OR and NOT gates (5 marks) (b) Correlate with relevant circuit diagrams the working of NAND and NOR gates as universal building blocks (15 marks)
14.	(a) Deduce the Galilean transformation equations (15 marks) (b) What would be the pressure inside a small air bubble of $10^{-4} m$ radius, situated just below the surface of water? Surface tension of water may be taken as $70 \times 10^{-3} N m^{-1}$ and atmospheric pressure to be $1.012 \times 10^{5} N m^{-2}$. (5 marks)
	SECTION E – K6 (CO5)
Answer any ONE of the following	**(1 x 20 = 20)**
15.	(a) Validate with a neat diagram the physical significance of the negative result obtained in the Michelson-Morley experiment. (15 marks) (b) Derive an expression for the energy stored in a stretched wire. (5 marks)
16.	What is a junction diode? Analyze the working of a P-N junction diode under forward and reverse biasing. Draw the current-voltage characteristic curve for the junction diode

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