Total number of printed pages: **Programme (Diploma)/I/105**

2023

APPLIED PHYSICS-I

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	What is S. I. Unit?	1
	b)	Define a Scalar and Vector quantity with examples.	2
	c)	Find the dimensional formula of the given physical quantities. Force, Pressure, Capacitance, Momentum, Impulse	5
		What do mean by dimensions of a physical quantity? Give examples. Check the following relation, is it dimensionally correct? $v^2 - u^2 = 2gh$	2+3 =5
	d)	Write the seven fundamental quantities and mention their S.I. units?	7
2.	a)	Define of inertia of rest and inertia of motion with examples.	4
	b)	State the Newton's three Laws of motion.	3
	c)	Starting from Newton's 2nd law, obtain the expression of the impressed force, $\vec{F} = m\vec{a}$ where m is the mass of the body and $\vec{a}$ is its acceleration.	4
	d)	Write few differences between mass and weight.	2
	e)	State the law of conservation of linear momentum. Give examples.	3
	f)	Calculate $\vec{A}.\vec{B}$ and $\vec{A} \times \vec{B}$, if $\vec{A} = 3\hat{\imath} - 2\hat{\jmath} + 7\hat{k}$ & $\vec{B} = 5\hat{\imath} + 6\hat{\jmath} - 3\hat{k}$.	4
3.	a)	What is angular velocity?	1
	b)	Obtain the relation between angular velocity and linear velocity.	3
	c)	Define: centripetal and centrifugal force. Write the expression of centripetal force.	2+1 = 3
	d)	Define: work, power and energy.	3
	e)	What is Kinetic energy and potential energy? Write their mathematical expressions. Calculate Kinetic energy of a meteor of mass 2 ton moving with a uniform velocity of 600km/hour.	4+4 =8
	e)	Define Simple Harmonic Motion.	2
4.	a)	State the Newton's law of gravitation and obtain the expression of force of gravitation between two bodies of masses m_1 and m_2 separated by a distance r.	2+3 = 5

	b)	What is the unit and dimensional expression of universal gravitation constant?	1+2 = 3
	c)	Derive the relation between 'G' and 'g'. What will be the weight of a body at the centre of the earth?	6+2 = 8
	d)	Define centre of gravity and centre of mass.	4
5.	a)	Define deforming force and restoring force.	2
	b)	State Hooke's law.	2
	c)	Define Young's modulus, Bulk modulus and Modulus of rigidity with their mathematical expressions.	6
	d)	Which is more elastic, rubber or steel? Give reasons.	3
	e)	State Poisson's ratio. What is its unit?	2
	f)	What force is required to stretch a steel wire to double its length when its area of cross section is 1 cm^2 and Young's' modulus is 2×10^{12} dyne cm^{-2}?	5
6.	a)	Name the four scales of measurement of temperature? Write the conversion formula from one scale to another or vice versa.	2+2 = 4
	b)	What is thermal expansion? Give examples.	2
	c)	Define co-efficient of linear expansion (α), co-efficient of superficial expansion (β) and co-efficient of volume expansion (γ).	6
	d)	Write the relationship between co-efficient of linear expansion (α), co-efficient of superficial expansion (β) and co-efficient of volume expansion (γ).	2
	e)	How does density of a substance vary with temperature?	2
	f)	What is anomalous expansion of water? How do aquatic animals survive under water in the polar regions?	2+2 = 4
7.	a)	Define: Calorie, specific heat capacity, heat capacity, water equivalent, thermal conductivity.	5
	b)	Write few differences between Evaporation and Ebullition (boiling).	2
	c)	Define: specific latent heat of fusion and specific latent heat of vaporization.	2+2 = 4
	d)	What do you mean by the statement, 'Latent heat of fusion of ice is 80cal/g'?	2
	e)	State three modes of transmission of heat with examples.	3
	f)	What would be the final temperature of the mixture when 5g of ice at $-10^{\circ}C$ are mixed with 20 g of water at $60^{\circ}C$. Specific heat of ice is 0.5 and latent heat of ice is 80cal/g.	4
8.	a)	Define the amplitude, time period, frequency and wavelength of a wave.	8
	b)	Write the Newton's formula for the velocity of sound wave. Why and how Laplace did corrected Newton's formula.	4
	c)	State the difference with examples between (i) Mechanical and Electromagnetic wave (ii) Transverse and Longitudinal wave.	4+4 =8