

Score

Qn. No.	Answer	Score(marks)
I		
1.	Angular velocity $2\pi/T$. π rad/s.	1 1
2.	Any two equations ($\omega_2 = \omega_1 + \alpha t$, $\theta = \omega_1 t + \frac{1}{2} \alpha t^2$, $\omega_2^2 = \omega_1^2 + 2\alpha\theta$)	2
3.	g decreases	2
4.	Copper, silver or any two similar materials.	2
5.	Threshold wavelength or similar statement.	2
II		
1	Explanation of centripetal acceleration. $a = v^2/r$, with explanation of terms. any three examples of CF.	1 2 3 (1 each)
2.	Explain the term 'time period'. $T = 2\pi \frac{(R+h)}{v}$. Substituting value of v, $T = 2\pi \sqrt{\frac{(R+h)^3}{gR^2}}$ or similar equation. $T_0 = 2\pi \sqrt{\frac{R}{g}}$.	1 1 2 2
3.	Calculation of resistance approximately as 2 ohm. Substitution in the formula $\rho = \pi r^2 R/l$. Resistivity with unit as 1.256×10^{-7} ohm-m.	2 2 2
4	Effect of rotation Equation $g_\theta = g - R\omega^2 \cos^2\theta$ Effect of shape	2 2 2
5	Brief working of galvanometer(necessary idea only) Equation for current I proportional to θ , for a given galvanometer couple/twist; number of turns of galvanometer, magnetic field and area of coil are constants.	2 2 2
6	Stimulated emission, population inversion, pumping (with explanation). Monochromaticity, coherence, low divergence (with explanation).	3 3
7	Equation $v = c/\lambda$ Threshold frequency 4.5×10^{14} Hz Equation $\phi = hc/\lambda$ Work function 3×10^{-19} J	1 2 1 2

III	a) Statement $I = I_G + Ma^2$	2 1
	b) Diagram Equation of mass of the ring Equation of moment of inertia of the ring Moment of inertia of disc through integration, $\frac{1}{2} MR^2$	1 1 1 3
	c) $I = \frac{1}{2} MR^2 + MR^2$ Substitution $I = 0.375 \text{ Kg-m}^2$	2 2 2
IV	a) Statement $I = I_x + I_y$	2 1
	b) Rotational KE of disc $\frac{1}{2} I \omega^2$ Substitution of value of I and ω Rot. KE = $\frac{1}{4} MV^2$ Total KE = $\frac{3}{4} MV^2$	1 1 2 2
	c) $E = \frac{1}{2} I \omega^2$ Substitution ($I = \frac{1}{2} MR^2$, $\omega = 2\pi n$) $E = 3.94 \text{ J}$	2 2 2
V	a) Explanation (like: The angular velocity of such satellite matches with the rotational speed of earth)	3
	b) Equate centripetal force and gravitational force $V = \sqrt{\frac{GM}{R+h}}$ or similar eqn $V_0 = \sqrt{\frac{GM}{R}}$ OR \sqrt{gR}	1 3 2
	c) Eqn $V = \sqrt{\frac{GM}{R}}$ Substitution $V = 7.908 \text{ Km/s}$	2 2 2
VI	a) Definition	3
	b) Definition Equating KE and Gravitational PE Escape velocity $V = \sqrt{2gR}$ or similar eqn.	2 2 2
	c) Equation $V = \sqrt{2gR}$ Substitution $V = 11.2 \text{ Km/s}$	2 2 2
VII	a) Statement.	3
	b) Four arm net work P/ X=R/S. Connection diagram of meter bridge. $X = \frac{IR}{(100-I)}$	2 2 2

	<p>c) $I_1 + I_2 = I_3$ Left loop $1 \times I_1 + 1 \times I_3 = 4$ Right loop $1 \times I_2 + 1 \times I_3 = 2$ Solving $I_1 = 2A$, $I_2 = 0$, $I_3 = 2A$</p>	1 1 1 3
VIII	<p>Differentiate the galvanometer and ammeter</p> <p>a) Diagram with shunt resistance $I = I_G + I_S$ $I_G G = I_S S$ Substitution Shunt resistance $S = \frac{I_G G}{I - I_G}$</p> <p>b) diagram Eqn $S = \frac{I_G G}{I - I_G}$ Substitution Shunt resistance with unit $S = 8.005 \text{ m ohm}$</p>	3 1 1 1 1 2 1 1 1 3
IX	<p>a) Explanation of threshold frequency b) Einstein eqn. $h\nu = \phi + \frac{1}{2} m v^2$ $V = \sqrt{\frac{2h(\nu - \nu_0)}{m}}$ The factors (ν, ϕ or similar terms) c) Energy of incident radiation hc/λ Substitution Energy of incident radiation $3.9 \times 10^{-19} \text{ J}$ X1 and X2 will show photoelectric effect.</p>	3 1 1 2 2 1 1 2 2
X	<p>a) Explanation of neutron multiplication factor (K) K will determine whether the system is reactor or explosive b) About power reactor Explanation of components c) Eqn $E = mc^2$ Proper substitution Energy in Joule $18 \times 10^{11} \text{ J}$ Energy in electron volt $11.25 \times 10^{30} \text{ eV}$</p>	2 1 1 5 1 1 2 2