DIRECTORATE OF GOVERNMENT EXAMINATIONS, CHENNAI – 6
HSE (FIRST YEAR) EXAMINATION MARCH 2025
PHYSICS KEY ANSWER - ENGLISH MEDIUM

TOTAL MARKS - 70

NOTE:

1. Answer written only in **BLUE or BLOCK** should be evaluated.
2. Choose the most suitable answer in Part A from the given alternatives and write the option code and their corresponding answer.
3. For answers in Part – II, Part – III, Part – IV like reasoning, explanation, narration, description and listing of points, students may write in their in their own words but without changing the concepts and without skipping any point.
4. In numerical problems if formula is not written, marks should be given for the remaining correct steps.
5. In graphical representation, physical variables for X –axis and Y-axis should be marked.

PART - I

Answer **all** the Questions**.** **15×1=15**

Q. No	Option	Type - A	Q. No	Option	Type - B
1	(d)	$I = \frac{1}{3}Ml^2$	1	(d)	angular momentum
2	(d)	angular momentum	2	(b)	the centre point of the circle
3	(c)	$sin(x + vt)$	3	(d)	decrease
4	(b)	the centre point of the circle	4	(a)	$785m, zero$
5	(b)	net force on the object is zero	5	(d)	$75\,J$
6	(a)	a straight line	6	(c)	πs
7	(a)	average velocity	7	(a)	a straight line
8	(d)	$75\,J$	8	(d)	$I = \frac{1}{3}Ml^2$
9	(a)	velocity	9	(a)	average velocity
10	(a)	$785m, zero$	10	(a)	velocity
11	(d)	decrease	11	(c)	$sin(x + vt)$
12	(a)	$-9ms^{-1}$ and $5ms^{-1}$	12	(d)	$g = 25\,ms^{-2}$
13	(d)	torque and energy	13	(b)	net force on the object is zero
14	(d)	$g = 25\,ms^{-2}$	14	(a)	$-9ms^{-1}$ and $5ms^{-1}$
15	(c)	πs	15	(d)	torque and energy

PART - II

Answer **Any SIX** Questions. Question **No 24** is compulsory **6×2=12**

Q.No	Answer	Marks
16	The force acting on an objects is equal to the rate of change of its momentum. (or) $\vec{F} = \frac{d\vec{p}}{dt}$ (or) $\vec{F} = m\vec{a}$ Equation only ----- 1 Mark	2
17	PV diagram is a graph between pressure P and Volume V of the system (or) Pressure, Volume (Terms only) -------> ½+½	2
18	Formula $A = \frac{1}{2}\left\|\vec{A} \times \vec{B}\right\|$ $\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ 5 & -3 & 0 \\ 4 & 6 & 0 \end{vmatrix}$ $= \hat{\imath}(0) - \hat{\jmath}(0) + \hat{k}(42) = 42\hat{k}$ $\frac{1}{2}\left\|\vec{A} \times \vec{B}\right\| = \frac{1}{2} \times 42 = 21\ sq.unit$	½ 1 ½
19	i) Temperature ii) Pressure iii) Diameter of the molecules (Any Two factors)	2
20	$[LT^{-1}] = [LT^{-1}] + [LT^{-2}][T]$ $[LT^{-1}] = [LT^{-1}] + [LT^{-1}]$ **(or)** The dimensions of both sides are same ------ ½ The equation is dimensionally correct ------ ½	1 1
21	i) The opening and closing of a door about the hinges. ii) turning of a nut using a wrench. (or) Any Two other relevant examples	1 1
22	The frequency of External periodic force matches with the natural frequency of the vibrating body as a result the oscillating body begins to vibrate such that its amplitude increases at each step and ultimately its has a large amplitude. **Example :** The breaking of glass due to sound. (or) Any other relevant example	1½ ½

23	The gravitational force experienced by unit mass. (or) $\vec{E} = \frac{\vec{F}}{m}$ (or) $\vec{E} = \frac{-GM}{r^2}\hat{r}$ ------ 1 Mark Unit : N/kg (or) ms^{-2}	1½ ½
24	Formula $V = f\lambda$ (or) $\lambda = \frac{V}{f}$ f = no of oscillations/second $f = \frac{1}{T} \times 3000 = \frac{3000}{2 \times 60} = 25$ $\lambda = \frac{V}{f} = \lambda = \frac{900}{25} = 36m$ (or) Formula only ------ ½ Mark	½ 1 ½

PART - III

Answer **Any SIX** Questions. Question **No.33** is compulsory **6×3=18**

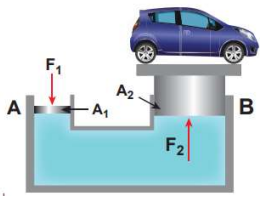
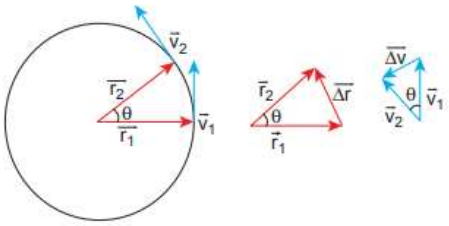
Q.No	Answer	Marks
25	Any **SIX** properties 6×½	3
26	Any **Three** postulates 3×1	3
27	Formula : $W = Fdr\,cos\theta$ $W = 25 \times 15 \times \cos 30^0 = 25 \times 15 \times \frac{\sqrt{3}}{2}$ $W = 324.76\,J$ ------ (½+½)	1 1 1
28	**Geo stationary satellite :** i) The time period 24 hrs ii) height from the surface of earth $36{,}000km$ ii) appear to be stationary when seen from Earth. **Polar satellite :** i)The time period 100 minutes ii)height from the surface of earth $500k$m to $800km$ ii)Satellite that orbits Earth from North pole to south pole.	1½ 1½

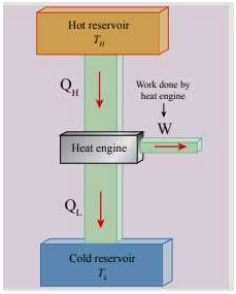
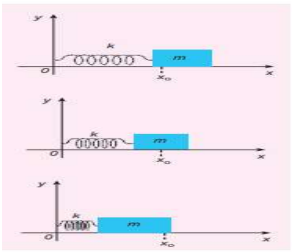
29	**Conduction :** The process of direct transfer of heat through matter due to temperature difference. **Convection** : The process in which heat transfer is by actual movement of molecules in fluids such as liquids and gases. **Radiation :** A form of energy transfer from one body to another by electromagnetic waves. (or) Conduction, Convection, Radiation (Only Names) ----- > 1½	1 1 1
30	Comparison of any three salient features 3×1	3
31	The antinode are not exactly formed at the open end, we have to include a correction called end correction **e,** by assuming that the antinode is formed at some small distance above the open end (or) $e = \frac{L_2 - 3L_1}{2}$ (Formula only) ------ 1 Mark	3
32	Angular momentum $L = I\omega$, Torque $\boldsymbol{\tau = I\alpha}$ $\tau = I\frac{d\omega}{dt} = \frac{d(I\omega)}{dt}$ $\tau = \frac{dL}{dt}$	1 1 1
33	Formula $\frac{F}{A} = Y \times \frac{\Delta L}{L} (or)\ \Delta L = \left(\frac{F}{A}\right)\left(\frac{L}{Y}\right)$ $\Delta L = \left(\frac{50}{1.25 \times 10^{-4}}\right)\left(\frac{10}{4 \times 10^{10}}\right)$ $\Delta L = 10^{-4}\, m$ -----> ½+½	1 1 1

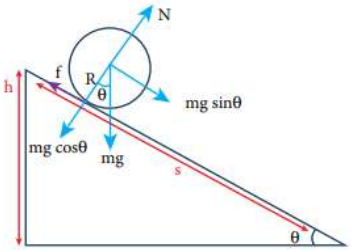
PART – IV

Answer **all** the questions. 5×5=25

Q.No	Answer	Marks
34 (a)	**1.Systematic errors Explanation**	1
	Instrumental errors Explanation Imperfections in experimental technique Explanation. Personal errors Explanation Errors due to External causes Explanation Least count error Explanation	2
	2. Random Error explanation	1
	3.Gross Error explanation	1
	(or)	
	Any three errors name only ----> 2 marks	
	(OR)	
34 (b)	Newton's equation by isothermal process	½
	$PV = constant$	½
	$P = -\frac{VdP}{dV} = K_I$	½
	$V_T = \sqrt{\frac{K_I}{\rho}} = \sqrt{\frac{P}{\rho}}$	½
	$V_T \approx 280 ms^{-1}$	½
	Laplace's Correction by adiabatic process	½
	$PV^{\gamma} = constant$	½
	$\gamma P = -\frac{VdP}{dV} = K_A$	½
	$V_A = \sqrt{\frac{\gamma P}{\rho}} = \sqrt{\gamma\, V_T}$	½
	$V_A = 331.3\, ms^{-1}$	½
35 (a)	To avoid skidding problem, the outer edge of the road is slightly raised compared to inner edge.	1
	Diagram	1
	$N\cos\theta = mg$ $N\sin\theta = \frac{mv^2}{r}$ $\tan\theta = \frac{v^2}{rg}$ $v = \sqrt{rg\tan\theta}$	2
	The banking angle and radius of curvature of the road determines the safe speed of the car at the turning.	1

	(OR)	
35 (b)	Pascal's law States that if the pressure in liquid is changed at a particular point the change is transmitted to the entire liquid without being diminished in magnitude.	1
	Diagram  	½
	Explanation.	½
	$F_2 = P \times A_2$ $P = F_1/A_1$ $F_2 = \frac{F_1}{A_1} \times A_2$ $F_2 = \frac{A_2}{A_1} \times F_1$	2
	$\frac{A_2}{A_1}$ – mechanical advantage of the lift .	1
36 (a)	Diagram  	1
	Explanation	1
	$\frac{\Delta r}{r} = -\frac{\Delta V}{V} = \theta$	1
	$\Delta V = -V\left(\frac{\Delta r}{r}\right)$ $a = \frac{\Delta V}{\Delta t} = -\frac{V}{r}\left(\frac{\Delta r}{\Delta t}\right)$	1
	$a = -\frac{V^2}{r}$	1
	(OR)	

36 (b)	Diagram  **PARTS** Hot reservoir working substance cold reservoir **(Explanation)** **(Or)** (Name of the parts only ------- 1 Mark)	1 1½
	$Q_H = W + Q_L$ $W = Q_H - Q_L$ **(Or)** Input heat = workdone + ejected heat	1
	$\eta = \frac{Output}{Input} = \frac{W}{Q_H} = \frac{Q_H - Q_L}{Q_H}$	½
	$\eta = 1 - \frac{Q_L}{Q_H}$	1
37 (a)	Diagram 	1
	Explanation	½
	$F \propto x$ $F = -kx$	½
	$m\frac{d^2x}{dt^2} = -kx$ $\frac{d^2x}{dt^2} = -\frac{k}{m}x$	1
	$\omega^2 = \frac{k}{m}$ $\omega = \sqrt{\frac{k}{m}}$	1
	$T = 2\pi\sqrt{\frac{m}{k}}$	½
	$f = \frac{1}{T} = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$	½
	(OR)	

37 (b)	Diagram  	1
	Explanation	1
	$mg\ sin\theta - f = ma$ $Rf = I\alpha$	1
	$Rf = mk^2\left(\frac{a}{R}\right)$ $f = ma\left(\frac{k^2}{R^2}\right)$ $mg\ sin\theta - ma\left(\frac{k^2}{R^2}\right) = ma$ $mg\ sin\theta = ma\left(1 + \frac{k^2}{R^2}\right)$	1
	$a = \frac{gsin\theta}{1 + \frac{k^2}{R^2}}$	1
38 (a)	i) Power definition: rate of workdone or energy delivered (or) $P = \frac{Workdone}{time\ taken}$ $(or) P = \frac{W}{t}$ ------ 1 Mark	2
	Units : Watt (W), kilowatt (kW), mega watt (MW), Giga watt (GW), horse power (hp) - **any two units**	1
	(ii) Electrical energy $= power \times time\ of\ usage = P \times t$	½
	$= 75 \times 8 \times 30$ $= 18000\ watt\ hour$	½
	1 electrical unit = $1\ kWh = 1000\ Wh$	½
	electrical energy = $18\ unit$ **(OR)**	½

38 (b)	**i)** $Total\ energy\ of\ satellite\ = potential\ energy\ +\ kinetic\ energy$ $potential\ energy \quad U = -\frac{GM_sM_E}{(R_E+h)}$ $kinetic\ energy \quad KE = \frac{1}{2}M_sv^2$ $v = \sqrt{\frac{GM_E}{(R_E+h)}}$ $KE = \frac{1}{2}\frac{GM_sM_E}{(R_E+h)}$ (upto) $E = \frac{1}{2}\frac{GM_sM_E}{(R_E+h)} - \frac{GM_sM_E}{(R_E+h)}$ $E = -\frac{1}{2}\frac{GM_sM_E}{(R_E+h)}$ (upto) **(ii) Energy of moon** Mere Attempt	½ ½ 1 1 2