



PHYSICS HSSC-I
SECTION – A (Marks 17)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

حصہ اول لازمی ہے اس کے جوابات اسی طور پر دئے گئے کہ تمام حصے کو الگ الگ دیا گیا ہے۔
کچھ کی اجازت نہیں ہے اس کا استعمال گریٹ ہے۔

Version No.			
3	0	8	4

ROLL NUMBER					

0	●	0	0
1	1	1	1
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4	4	4	●
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9	9	9	9

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6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

Answer Sheet No. _____

Invigilator Sign _____

Fill the relevant bubble against each question according to curriculum: Candidate Sign. _____

Question	A	B	C	D	A	B	C	D
1. Which one of the following is a dimensionless quantity?	Strain	Spring constant 'K'	Young's constant 'Y'	Stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Real and apparent weights of a body seem to be equal when body moves with acceleration:	$a > g$	$a = g$	$a = 0$	$a < g$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Gravity performs zero work when body moves:	Vertically	At an angle of 30°	At an angle of 60°	Horizontally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Which one is TRUE for isothermal process?	$\Delta W = 0$	$\Delta Q = \Delta W$	$\Delta U = \Delta W$	$\Delta Q = 0$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. If the temperatures of source and sink of a Carnot engine (having efficiency η_1) are each increased by $200K$, then the efficiency η_2 will:	Decrease	Become 1	Remain unaffected	Increase	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Due to which phenomenon different colours appear in soap film in sunlight?	Diffraction of light	Scattering of light	Interference of light	Dispersion of light	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. In Young's double slit experiment, the fringe spacing is:	$\frac{d}{\lambda L}$	$\frac{\lambda}{Ld}$	$\frac{L}{\lambda d}$	$\frac{\lambda L}{d}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. For constructive interference, Path difference, $d =$	$\left(m + \frac{1}{2}\right)\lambda$	$\left(m - \frac{1}{2}\right)\lambda$	$m\lambda^2$	$m\lambda$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. When length of a simple pendulum is doubled, the ratio of old to new time period will be:	1:1	1:2	$1:\sqrt{2}$	2:1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. If 30 waves pass through a medium in 1 second with speed of $30ms^{-1}$ then the wave length of waves is:	$1w$	$2w$	$400w$	$20w$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Stars moving away from the earth show:	Blue shift	Red shift	Violet shift	Black shift	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. If tension in a stretched string is made four times then velocity of waves:	Becomes twice	Becomes half	Remains same	Becomes four times	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. The dimension of spring constant k is:	$[MT^{-2}]$	$[ML^{-1}]$	$[MLT^{-1}]$	$[MLT^1]$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. The velocity of projectile at its maximum height is:	$v_i \cos \theta$	Maximum	Zero	$v_i \sin \theta$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. If $\vec{A} = 2\hat{i} - \hat{j} + 3\hat{k}$ then magnitude of \vec{A} is:	$\sqrt{14}$	$\sqrt{8}$	14	4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. $F\Delta t =$ _____	Time	Pressure	Impulse	Force	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. In equation of continuity, the 'volume flow rate' is equal to:	Ad	Ap	Av	ΔM	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

—1HA-I 2308—

• $T = 2\pi\sqrt{\frac{l}{g}}$ • $v = f\lambda$ • $A = \sqrt{A_x^2 + A_y^2 + A_z^2}$ • $\eta = 1 - \frac{T_2}{T_1}$ • $v = \sqrt{\frac{T \times L}{M}}$ • $\epsilon = \frac{M}{l_s}$ • $\sigma = \frac{F}{A}$ • $W = FS \cos \theta$ • $T = 2\pi\sqrt{\frac{m}{k}}$



PHYSICS HSSC-I

20

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

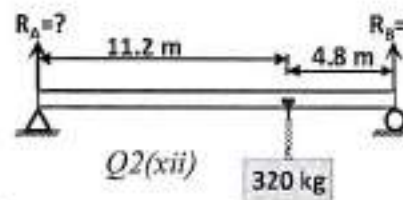
NOTE: Answer any FOURTEEN parts from Section 'B' and attempts any TWO questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

SECTION - B (Marks 42)

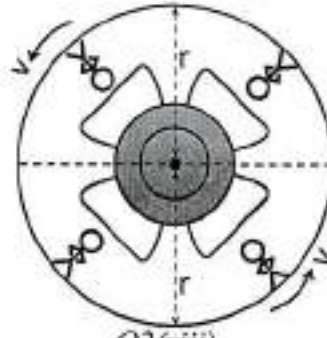
Q. 2 Answer any FOURTEEN parts. All parts carry equal marks.

(14 x 3 = 42)

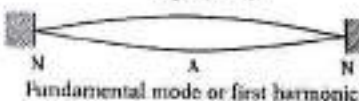
- (i) Differentiate between 'precision' and 'accuracy'.
- (ii) How are cranes able to lift heavy load without toppling? Explain briefly.
- (iii) Prove that the equation $E = hf$ is dimensionally correct. (Where E = energy and f = frequency)
- (iv) Co-relate Newton's third law of motion and conservation of momentum with the help of an example.
- (v) What is impulsive force? Explain the effect of lengthening of time on impulsive force. Give one of its common life applications.
- (vi) What will be the effect of gravity on vertical and horizontal components of projectile velocity? Give its mathematical expression(s).
- (vii) Describe that work done is equal to area under the force-displacement graph.
- (viii) What is escape velocity (v_{esc})? Derive the expression $v_{esc} = \sqrt{2gR_e}$.
- (ix) Why is a rifle barrel "rifled"? Give reason in context of conservation of angular momentum.
- (x) Briefly explain the following terms:
 - (a) Moment of inertia of a body
 - (b) Angular momentum
- (xi) Which object will attain terminal velocity first, a lighter object or a heavier object? Justify your answer.
- (xii) A 550 kg uniform I-beam supports a load of 320 kg as shown. Determine the reactions at the supports.



Q2(xii)
- (xiii) In orbiting satellites artificial gravity is created to counter balance weightlessness. Determine the frequency 'f' required to produce this artificial gravity.



Q2(xiii)
- (xiv) What will be the frequency of a simple pendulum if its length is 2 meters?
- (xv) How progressive waves differ from stationary waves? Give examples also.
- (xvi) Discuss first mode of vibration in a stretched string. Derive expression for its frequency.



Fundamental mode or first harmonic

Q2(xvi)
- (xvii) What is meant by the path difference with reference to the interference of two waves?
- (xviii) State Huygen's Principle. Use it to construct wave front after a time interval 't'.
- (xix) Is the energy degraded during all natural processes? Explain.
- (xx) Find Moon's angular momentum using Earth-Moon distance = 3.8×10^8 m and Mass of Moon = 7.35×10^{22} kg

SECTION - C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks.

(2 x 13 = 26)

- Q. 3
 - a. Show that the potential at a point is equal to work done in bringing a unit mass "m" from infinity to that point.
 - b. Differentiate 'molar specific heat at constant pressure (C_p)' and 'molar specific heat at constant volume (C_v)'. Justify that $C_p > C_v$. Also Prove that $C_p - C_v = R$
- Q. 4
 - a. Describe S.H.M. Prove that the Projection of a body moving in a circular path executes S.H.M along the diameter. Also derive an expression for time period and frequency of this body.
 - b. A source of sound and observer are moving toward each other. What happens to the apparent pitch heard by the observer? What will happen if both are moving away from each other? Explain and prove.
- Q. 5
 - a. State and derive Bernoulli's equation. Also give one of its applications.
 - b. Calculate the resultant of two forces of 30N and 40N acting at a point making angles of 0° and 120° with x-axis respectively.

Important formulae:

- $f = \frac{1}{T}$
- $F = \sqrt{F_x^2 + F_y^2}$
- $T = 2\pi\sqrt{\frac{l}{g}}$
- $\vec{L} = \vec{r} \times \vec{p}$
- $\vec{p} = m\vec{v}$
- $V_f = \frac{2\rho g r^3}{9\eta}$
- For equilibrium $\sum \tau_o = 0$, $\sum F_x = 0$, $\sum F_y = 0$
- Planck's Constant $h = 6.626 \times 10^{-34}$ JS
- $F_R = \sqrt{F_{Rx}^2 + F_{Ry}^2}$
- $\theta = \tan^{-1}\left(\frac{F_{Ry}}{F_{Rx}}\right)$
- $J = F \times \Delta t$
- $\vec{r} = \vec{r} \times \vec{F}$
- $\Delta p = F \times \Delta t$
- $V_f = \frac{\eta r g}{6\pi \eta r}$



PHYSICS HSSC-I
SECTION - A (Marks 17)

Time allowed: 25 Minutes

Section - A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

حصہ اول لازمی ہے اس کے جوابات ہی مطلوب ہے کہ غلطیوں سے اجتناب کریں۔ اسے ہاتھ سے لکھیں۔
گنڈے کی مدد سے لکھیں۔ اسے اسٹینل سٹائل میں لکھیں۔

Version No.			
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ROLL NUMBER					

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Answer Sheet No. _____

Invigilator Sign. _____

Fill the relevant bubble against each question according to curriculum:

Candidate Sign. _____

Question	A				B				C				D			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1. In Young's double slit experiment, the fringe spacing is:	$\frac{d}{\lambda L}$	$\frac{\lambda}{Ld}$	$\frac{L}{\lambda d}$	$\frac{\lambda L}{d}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. The SI unit of product of pressure and volume is:	Watt	Pascal	Newton	Joule	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. According to first law of thermodynamics, which one is correct?	$C_v = 1 + \frac{R}{C_p}$	$R = \frac{C_v}{C_p}$	$C_p = R + C_v$	$C_p + C_v = R$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. One radian = _____	157.3°	90°	57.3°	180°	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. If $\vec{a} = 5\hat{i} - \hat{j}$ then this vector makes an angle of _____ with positive x-axis.	449°	249°	349°	149°	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. A car is moving on a motorway. Point out the correct velocity-time graph which shows zero acceleration of car.					<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. A stone is thrown to perform projectile motion. Which one of the following is TRUE for its vertical acceleration?	Constant	Maximum at highest point only	Maximum at the point of projection only	Zero	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Gravity performs zero work when body moves:	Horizontally	At angle of 30°	At angle of 60°	Vertically	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Power, $P =$ _____	$\vec{F} \cdot \vec{v}$	\vec{F} / \vec{A}	\vec{F} / \vec{v}	$\vec{F} \cdot \vec{d}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. The ratio of angular momentum and angular velocity is equal to:	Moment of inertia	Angular acceleration	Torque	Mass	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Real and apparent weights of a body seem to be equal when:	$a = 0$	$a < g$	$a > g$	$a = g$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. The fluid speed is measured by:	Barometer	Hydrometer	Monometer	Venturi meter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. If the period of oscillation of mass M suspended from a spring is $2S$, then the period of mass $16M$ will be:	2S	4S	8S	1S	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. The total energy of a particle executing S.H.M is proportional to:	Frequency of oscillation	Velocity of particle	Square of amplitude of motion	Displacement from mean position	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. The fundamental frequency of an open organ pipe is "f". What will be fundamental frequency if its one end is closed?	$1/f$	$2/f$	$3/f$	$0.5/f$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. The speed of sound in air does not depend upon:	Density	Humidity	Temperature	Pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. Due to which phenomenon different colours appear in soap film in sunlight?	Diffraction of light	Scattering of light	Interference of light	Dispersion of light	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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- $\theta = \tan^{-1} \left(\frac{F_y}{F_x} \right)$
- $T = 2\pi \sqrt{\frac{m}{k}}$
- $2\pi \text{rad} = 360^\circ$
- $L = I\omega$
- $(K.E)_{\text{max}} = \frac{1}{2} kx^2$
- $f_c = \frac{(2n-1)v}{4L}$
- $f_{\text{closed}} = \frac{v}{4L}$
- $f_{\text{open}} = \frac{v}{2L}$
- $v = \sqrt{\frac{E}{\rho}}$
- $f_n = \frac{nv}{2l}$
- $v = \sqrt{\frac{\gamma RT}{m}}$



PHYSICS HSSC-I

22

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

NOTE: Answer any FOURTEEN parts from Section 'B' and attempts any TWO questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

SECTION - B (Marks 42)

Q. 2 Answer any FOURTEEN parts. All parts carry equal marks. (14 x 3 = 42)

- (i) Describe the terms 'error' and 'uncertainty' in context of measurements.
- (ii) The length and width of a mobile phone is $(8.30 \pm 0.01) \text{ cm}$ and $(4.60 \pm 0.01) \text{ cm}$ respectively. Calculate the area of mobile phone and uncertainty in area.
- (iii) Prove that the magnitude of vector product of two vectors is equal to area of Parallelogram.
- (iv) In simple harmonic motion, at mean position velocity is maximum while acceleration is zero. Why?
- (v) Differentiate between 'elastic' and 'inelastic' collisions with examples.
- (vi) At what angle a stone is thrown such that its horizontal distance and vertical height become equal?
- (vii) Calculate escape velocity for Mars if radius and acceleration due to gravity for Mars are $3.4 \times 10^6 \text{ m}$ and 3.7 m/s^2 respectively.
- (viii) If a satellite is in the state of free fall, then why does it not fall on the earth?
- (ix) Yellow light of wavelength $5893 \times 10^{-10} \text{ m}$ is directed upon two narrow slits 0.20 cm apart in Young's experiment. Find the position of the first bright and dark fringes on a screen 200 cm away.
- (x) Which wheel of the tractor shown in figure shall rotate faster when tractor moves with uniform velocity? Explain briefly.
- (xi) Does the magnitude of viscous force in fluid flow depend on the shape and velocity of the object? Justify your answer.
- (xii) When water falls from a tap its cross-sectional area decreases as it comes down. Why?
- (xiii) Calculate acceleration of simple pendulum executing S.H.M with time period of 0.60 s at displacement 0.05 m .
- (xiv) What will be the frequency of a simple pendulum if its length is 2 meters?
- (xv) Discuss stationary waves in a stretched string when string is plucked at quarter length of string.
- (xvi) What is meant by the path difference with reference to the interference of two waves?
- (xvii) Prove $2d \sin \theta = n\lambda$, Bragg's law, for diffraction of X-rays through crystals.
- (xviii) Is the energy degraded during all natural processes? Explain briefly.
- (xix) Why do bowlers shine one side of cricket ball? Explain with reference to Bernoulli effect.
- (xx) Describe the terms 'beat' and 'beat frequency'. How are beats useful for tuning the musical instruments?



Q2(x)

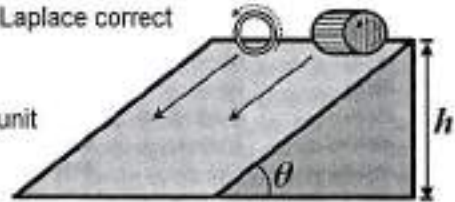


Q2(xii)

SECTION - C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. (2 x 13 = 26)

- Q. 3 a. What is meant by scalar product of two vectors? Express the scalar product of two vectors in terms of their rectangular components. Also prove that $\vec{A} \cdot \vec{B} = \vec{B} \cdot \vec{A}$
- b. What is Newton's formula for the speed of sound in the air? How did Laplace correct this formula? Explain in detail.
- Q. 4 a. Show that the potential at a point is equal to work done in bringing a unit mass 'm' from infinity to that point.
- b. Calculate and compare the velocities of Ring (hoop) and Disc (cylinder) at the bottom of inclined plane of height 'h'.
- Q. 5 a. Differentiate 'molar specific heat at constant pressure (C_p)' and 'molar specific heat at constant volume (C_v)'. Justify that $C_p > C_v$. Also Prove that $C_p - C_v = R$
- b. An object is at rest, a constant force acts on it and it starts moving with constant acceleration of 10 m/s^2 . How much distance will it travel in 3rd second of its Journey.



Q4(b)

Important formulae:

$v = r\omega$ $a = -\omega^2 x$ $v_{ec} = \sqrt{2gR}$ $R = \frac{v^2 \sin 2\theta}{g}$ $H = \frac{v^2 \sin^2 \theta}{2g}$ $\vec{A} \cdot \vec{B} = AB \cos \theta$ $T = \frac{2\pi}{\omega}$ $F_s = 6\pi\eta r v$ $f = \frac{1}{T}$
 $L = I\omega$ $y_{\text{node}} = \frac{L\lambda}{d}$ $y_{\text{antinode}} = \frac{L\lambda}{2d}$ $v_f = v_i + at$ $2aS = v_f^2 - v_i^2$ $S = v_i t + \frac{1}{2}at^2$ $\vec{L} = \vec{r} \times \vec{p}$ $\vec{p} = m\vec{v}$ $T = 2\pi \sqrt{\frac{l}{g}}$