FSD

Intermediate Part First (New Scheme)
PHYSICS (Objective)   GROUP - I
Time: 20 Minutes   Marks: 17

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Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.

S.#	Questions	A	B	C	D
1	Equation of continuity gives conservation of:	Energy	Power	Mass	Density
2	Orbital velocity of a satellite of mass "m_s" orbiting around earth of mass "M" is:	$\sqrt{\dfrac{GM}{r}}$	$\sqrt{\dfrac{Gm_s}{r}}$	$\dfrac{GM}{r}$	$\sqrt{gR}$
3	In rotational motion analogous of force is:	Torque	Inertia	Velocity	Momentum
4	Scalar product of force and velocity is:	Work	Power	Energy	Acceleration
5	Impulse has same unit as that of:	Force	Energy	Mass	Linear momentum
6	Cross-product of $\hat{j} \times \hat{k}$ is:	Zero	1	$\hat{i}$	$-\hat{i}$
7	Rectangular components have angle between them is:	30°	45°	60°	90°
8	The quantity 2.3×10^{-3} can be written as:	0.0023	0.023	0.23	2.3
9	Light year is the unit of:	Light	Time	Velocity	Distance
10	An ideal heat engine can only be 100% efficient if its cold temperature is:	0K	0°C	100K	100°C
11	Average translational K.E of a gas molecule is:	$\dfrac{1}{2}kT$	kT	$\dfrac{2}{3}kT$	$\dfrac{3}{2}kT$
12	Near point for a person is at:	25cm	25mm	25nm	25dm
13	Angle between ray of light and wave front is:	Zero	60°	45°	90°
14	Speed of sound in vacuum is:	$332\dfrac{m}{s}$	$333\dfrac{m}{s}$	$280\dfrac{m}{s}$	Zero
15	If a string vibrates in " n " loops, the wavelength of stationary wave will be:	$\dfrac{2\ell}{n}$	$\dfrac{n\ell}{2}$	$\dfrac{2n}{\ell}$	$\dfrac{\ell}{2n}$
16	Product of frequency " f " and time " t " is:	1	Displacement	Velocity	Amplitude
17	Product of area of cross section, velocity and time gives:	Volume	Density	Mass	Weight

SECTION – I

2. Write short answers to any EIGHT parts.   16

(i) Write the dimensions of pressure and density.
(ii) Define radian and steradian.
(iii) Two vectors have unequal magnitudes. Can their sum be zero? Explain.
(iv) Suppose the sides of a closed polygon represent vectors arranged head to tail. What is the sum of these vectors?
(v) Give two factors on which turning effect depends.
(vi) When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
(vii) Define law of conservation of energy.
(viii) Explain the difference between laminar flow and turbulent flow.
(ix) Define venturi effect. Also write its relation.
(x) If a mass spring system is hung vertically and set into oscillations, why does the motion eventually stop?
(xi) Describe some common phenomena in which resonance plays an important role.
(xii) Define periodic motion. Give example.

3. Write short answers to any EIGHT parts.   16

(i) At what point or points in its path does a projectile have its minimum speed, its maximum speed?
(ii) Can the velocity of object reverse the direction when acceleration is constant? If so, give an example.
(iii) The horizontal range of projectile is four times of its maximum height. What is angle of projection?
(iv) Define ballistic flight and ballistic trajectory.
(v) When mud flies off the tyre of a moving bicycle, in which direction does it fly? Explain.
(vi) Why does a diver change his body positions before and after diving in the pool?
(vii) Differentiate between real weight and apparent weight.
(viii) How many radians are there in 2 degree?
(ix) Explain the terms crest, trough node and anti-node.
(x) How are beats useful in tuning musical instruments?
(xi) Why sound travel faster in hydrogen than in oxygen?
(xii) What do you mean by sonar technique? Explain briefly.

4. Write short answers to any SIX parts.   12

(i) How would you distinguish between un-polarized light and polarized light?
(ii) An oil film spreading over a wet footpath shows colours. Explain how does it happen?
(iii) Under what conditions two or more sources of light behave as coherent sources?
(iv) Why would it be advantageous to use blue light with a compound microscope?
(v) Differentiate between linear magnification and angular magnification.
(vi) Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
(vii) Is it possible to convert internal energy into mechanical energy? Explain with an example.
(viii) Does the entropy of a system increase or decrease due to friction? Explain briefly.
(ix) State first law of thermodynamics.

SECTION – II   Attempt any THREE questions. Each question carries 08 marks.

5. (a) Derive Boyle's law and Charle's law from the pressure of a gas equation.   05
   (b) Suppose, we are told that the acceleration of a particle moving in a circle of radius r with uniform velocity v is proportional to some power of r, say r^n, and some power of v, say v^m, determine the powers of r and v.   03

6. (a) Define vector product. Write any four characteristics of vector product.   05
   (b) A 100g golf ball is moving to the right with a speed of $20ms^{-1}$. It makes a head on collision with an 8kg steel ball, initially at rest. Compute velocities of the balls after collision.   03

7. (a) Discuss the inter-conversion of potential and kinetic energy in absence of air friction. Also discuss the effect of air resistance.   05
   (b) A stationary wave is established in a string which is 120cm long and fixed at both ends. The string vibrates in four segments, at a frequency of 120Hz. Determine its wavelength and the fundamental frequency.   03

8. (a) What is simple pendulum? Show that motion of simple pendulum is simple harmonic. Also derive expression for its time period.   05
   (b) A gramophone record turntable accelerates from rest to an angular velocity of 45 rev./min in 1.60s. What is its average angular acceleration?   03

9. (a) What is simple microscope? Describe its construction, working and also derive the relation for its angular magnification.   05
   (b) A light of $\lambda = 589nm$ is incident normally on grating having 3000 lines per centimeter. What is the highest order, the spectrum obtained with this grating?   03

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Q.No.1

S.#	Questions	A	B	C	D
1	The efficiency of diesel engine is about:	10% to 20%	15% to 25%	25% to 35%	35% to 40%
2	When all systems are taken together as the universe, the entropy of universe always:	Decrease	Increase	Remains unchanged	Nothing can be decided
3	Nature of image in compound microscope is:	Real and inverted	Real and erect	Virtual and inverted	Virtual and erect
4	In Young's double slit experiment, the fringe spacing is equal to:	$\dfrac{d}{\lambda L}$	$\dfrac{2\lambda d}{L}$	$\dfrac{\lambda L}{d}$	$\dfrac{\lambda d}{L}$
5	The frequency of sound in a medium is " f " and velocity " v ", if frequency in same medium becomes " 4f " then velocity will be:	v	2v	3v	4v
6	Speed of sound in vacuum at a temperature of 0°C is:	$332 ms^{-1}$	$340 ms^{-1}$	$333 ms^{-1}$	Zero
7	In mass spring system, $\frac{1}{2}kx_0^2$ represents:	Total energy	K.E	P.E	Velocity
8	Speed of efflux is measured by the relation:	$v = \sqrt{gh}$	$v = \sqrt{\dfrac{gh}{2}}$	$v = \sqrt{2gh}$	$\sqrt{\dfrac{4}{3}gh}$
9	The velocity of rain drop attains constant value due to:	Air currents	Upthrust of air	Surface tension	Viscous force exerted by air
10	A body is moving in a circular path. The angle between its linear velocity and angular velocity is:	180°	90°	45°	0°
11	In rotational motion, analogous of mass is:	Momentum	Inertia	Moment of inertia	Angular momentum
12	Area under force-displacement graph gives:	Velocity	Power	Work done	Acceleration
13	If the momentum of a body is numerically equal to its kinetic energy, then speed of body is:	$1 ms^{-1}$	$2 ms^{-1}$	$4 ms^{-1}$	$8 ms^{-1}$
14	Angle between the vectors $(\hat{i}+\hat{j})$ and $(\hat{j}+\hat{k})$ is:	0°	60°	90°	180°
15	Three vectors $\bar{A}$, $\bar{B}$ and $\bar{C}$ satisfy the relation $\bar{A}\cdot\bar{B}=0$ and $\bar{A}\cdot\bar{C}=0$, the vector $\bar{A}$ is parallel to:	$\bar{B}$	$\bar{C}$	$\bar{B}\cdot\bar{C}$	$\bar{B}\times\bar{C}$
16	If error in measurement of radius of circle is 2%, then permissible error in its area will be:	1%	2%	4%	8%
17	Dimensions of power are:	$[ML^2T^{-3}]$	$[M^2LT^{-2}]$	$[MLT^{-1}]$	$[MLT^{-2}]$

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Intermediate Part First (New Scheme)   Roll No. _____

PHYSICS   (Subjective)   GROUP - II

Time: 02:40 Hours   Marks: 68

SECTION – I

2. **Write short answers to any EIGHT parts.**   16
   (i)   Write the dimensions of pressure and density.
   (ii)   Differentiate between precise and accurate measurement.
   (iii)   Can the magnitude of a vector have negative value? Explain.
   (iv)   Can you add zero to a null vector? Explain.
   (v)   Determine the direction of $\bar{A} = -3\hat{i} - 8\hat{j}$ with positive x-axis.
   (vi)   An object has one joule of potential energy. Explain what does it mean?
   (vii)   What do you mean by aquifer?
   (viii) Explain the difference between laminar flow and turbulent flow.
   (ix)   How an aeroplane is lifted upward?
   (x)   Can we realize an ideal simple pendulum? Explain.
   (xi)   Does frequency depend on amplitude for harmonic oscillators?
   (xii)   A spring of spring constant 'k' is cut into two equal lengths then what will be the spring constant for each part? Explain.

3. **Write short answers to any EIGHT parts.**   16
   (i)   Show that impulse and momentum have same units.
   (ii)   An object is thrown vertically upward. Discuss the sign of acceleration due to gravity, relative to velocity while object is in air.
   (iii)   Explain the conditions in which velocity v and acceleration a of a car are perpendicular to each other.
   (iv)   Define ballistic missile and ballistic trajectory.
   (v)   Show that 1 rad = 57.3°
   (vi)   What is meant by moment of inertia? Explain its significance.
   (vii)   Describe what should be the minimum velocity for a satellite to orbit close to the earth around it.
   (viii) How artificial gravity is produced in the artificial satellite? Explain.
   (ix)   How are beats useful in tuning a musical instrument? Explain.
   (x)   Why sound travels faster in solids than in gasses?
   (xi)   Define electromagnetic waves. Give example.
   (xii)   Is it possible for two identical waves travelling in same direction along a string to give rise to stationary waves? Explain.

4. **Write short answers to any SIX parts.**   12
   (i)   Give the two parts of Huygen's principle.
   (ii)   Under what conditions two or more sources of light behave as coherent sources?
   (iii)   How would you distinguish between un-polarized and plane-polarized lights?
   (iv)   What is resolving power of an optical instrument? Give its formula.
   (v)   Why would it be advantageous to use blue light with a compound microscope?
   (vi)   Derive Charles' law from the kinetic molecular theory of gasses.
   (vii)   Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
   (viii) Can the mechanical energy be converted completely into heat energy? If so give an example.
   (ix)   Does entropy of a system increase or decrease due to friction? Briefly explain using formula for change in entropy.

SECTION – II   Attempt any THREE questions. Each question carries 08 marks.

5. (a) What is meant by dimensions of physical quantities? How can you derive formula for the time period of simple pendulum using dimensional analysis?   05
   (b) Estimate the average speed of nitrogen molecules in air under standard conditions of pressure and temperature.   03

6. (a) State and prove law of conservation of momentum.   05
   (b) Two particles are located at $\vec{r_1} = 3\hat{i} + 7\hat{j}$ and $\vec{r_2} = -2\hat{i} + 3\hat{j}$ respectively. Find both the magnitude of the vector $(\vec{r_2} - \vec{r_1})$ and its orientation with respect to the x-axis.   03

7. (a) What are stationary waves? Discuss the stationary waves in air column with (i) both ends open (ii) one end open.   01,04
   (b) How large a force is required to accelerate an electron (m=9.1×10⁻³¹kg) from rest to a speed of $2.0 \times 10^7 ms^{-1}$ through a distance of 5.0cm ?   03

8. (a) Derive a relation for the frequency of a rotating spaceship to achieve the artificial gravity equal to earth's gravity.   05
   (b) A block of mass 4kg is dropped from a height of 0.80m on to a spring of spring constant k = 1960 N/m. Find the maximum distance through which the spring will be compressed.   03

9. (a) What is diffraction grating? Derive grating equation for finding the wavelength of light used.   05
   (b) An astronomical telescope having magnifying power of 5 consists of two thin lenses 24cm apart. Find the focal lengths of the lenses.   03