PHYSICS
2014

Time: 20 Minutes   Max. Marks: 17

SECTION "A" (MULTIPLE CHOICE QUESTION)

1. Choose the correct answer for each from the given options:

(i) If a person ascends from the surface of the earth to a distance equal to the radius of the earth, the value of g will be:
   $\frac{1}{2}$ g $\frac{1}{4}$ g   2g   4g

(ii) Kilowatt hour is a unit of:
   * Energy   * Power   * Time   * Force

(iii) The earth quake waves are the example of:
   * Audible Waves   * Infrasonic waves
   * Shock waves   * Ultrasonic waves

(iv) The unit of Luminous intensity is:
   * Decibel   * Candela   * Dioptre   * $\frac{W}{m^2}$

(v) The distance between two consecutive nodes of stationary waves will be:
   * λ   * $\frac{λ}{2}$ * 2λ   * λ/2

(vi) If an object is placed at principle focus 'F' of a converging lens, the image will be formed:
   * at F   * at 2F   * at infinity
   * between focus & optical centre

(vii) If $\vec{A} = 5\hat{i} + \hat{j}$ and $\vec{B} = 2\hat{k}$ then $\vec{A} - \vec{B}$ is equal to:
   * $5\hat{i}+\hat{j}+2\hat{k}$ * $5\hat{i}-\hat{j}-2\hat{k}$ * $5\hat{i}+\hat{j}-2\hat{k}$ * $-5\hat{i}-\hat{j}+2\hat{k}$

(viii) Diffraction of light is a special type of:
   * reflection   * refraction   * interference   * polarization

(ix) An angel subtended at its centre by an arc whose length is double to that of its radius will be:
   * 84.3°   * 57.3°   * 114.6°   * 168.6°

(x) The length of a Galilean telescope when focused for infinity is:
   * F_0/F_e * F_e/F_0 * $F_0 + F_e$ * $F_0 - F_e$

(xi) Artificial gravity can be created in the spaceship by producing:
   * translatory motion   * vibratory motion
   * spin motion   * orbital motion

(xii) If mass and speed both are doubled, the kinetic energy will be: * double * four times * five times * eight times

(xiii) The Noble price in Physics was awarded to this Pakistani scientist:
   * Dr. Abdul Qadeer Khan   * Dr. Saleem uz Zaman Siddiqui
   * Dr. Abdus Salam   * Dr. Samar Mubarak Mand

(xiv) In Young's double slit experiment, the fringe spacing is:
   * $\frac{dλ}{L}$ * $\frac{Lλ}{d}$ * $\frac{Ld}{λ}$ * $Lλd$

(xv) If the mass of the bob of a simple pendulum is doubled, its time period will be: * be doubled * become triple * remain the same * halved

(xvi) If $\vec{A}.\vec{B}=0$, $\vec{A}\times\vec{B}=0$ and $\vec{A}\neq0$ vector $\vec{B}$ is equal to:
   * equal to $\vec{A}$ * Zero
   * perpendicular to $\vec{A}$ * Anti parallel to $\vec{A}$

(xvii) The dimension of Torque is:
   * ML^2T * ML^2T^{-2} * ML^2T^2 * MLT^2

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Time: 2 Hours 40 Minutes   Marks: 68

SECTION 'B' (SHORT-ANSWER QUESTIONS)(40)

NOTE: Answer any 10 questions from this section.

2.(i) A particle of mass 500 gm rotates in a circular orbit of radius 25 cm at a constant rate of 1.5 revolutions per second. Find the angular momentum with respect to centre of the orbit.

(ii) How is the magnifying power of the (i) Astronomical telescope and (ii) Compound microscope affected by increasing the focal length of their objectives?

(iii) Derive an expression for the variation of 'g' with altitude.

(iv) A car starts from rest and moves with a constant acceleration. During the 4th second of its motion, it covers a distance of 24 metres. Calculate the acceleration and the total distance covered by the car during this time.

(v) If the tension in a wire is increased four times, what will be the effect on the speed of standing waves in the string?

(v) What is difference between static and dynamic equilibrium? State the conditions of equilibrium.
OR A string 2m long and mass 0.004kg is stretched horizontally by passing one end over a frictionless pulley and attaching a 1kg mass vertically to it. Find the speed of the transverse waves on the string. Find the frequency of the second and fourth harmonics to which the string will resonate.

(vii) State and prove the law of Conservation of Linear Momentum.

(viii) Green light wavelength 5400 Å is diffracted by grating having 2000 lines/cm. Compute the angular deviation of the third order image.

(ix) A mortar shell is field at a ground level target of 400 m distance with an initial velocity 85m/sec. Calculate the maximum time to hit the target.

(x) Determine the unit vector perpendicular to the plane containing $\vec{A}$ and $\vec{B}$. If $\vec{A}=2\hat{i}-3\hat{j}-\hat{k}$, $\vec{B}=\hat{i}+4\hat{j}-2\hat{k}$.
OR Prove that $|A\times B|^2 + (A.B)^2 = A^2B^2$

(xi) Prove that the gravitational field is conservation field.

(xii) Calculate the centripetal acceleration and centripetal force on a man whose mass is 80 kg when resting on the ground at the equator if the radius of earth is 6.4×10^6 metres.

(xiii) The radius of moon is 27% of the earth's radius and its mass is 1.2% of the earth's mass. Find the acceleration due to gravity on the surface of the moon.

(xiv) A pump of how much minimum horse power is needed to lift water through a height of 50g/min?

(xv) A watch maker uses a magnifying glass of focal length 5cm to see the damaged spring of a watch. If he holds the glass close to the eye what is the best position of the object? What is the linear magnification?
OR Differentiate between Fresnel & Fraunhofer diffraction.

SECTION 'C' (DETAILED-ANSWER QUESTIONS)

NOTE: Answer any Two questions from this section. Draw diagrams where necessary. (28)

3.(a) Define elastic and inelastic collisions. Two non-rotating spheres of masses m_1 & m_2 initially moving with the velocities U_1 and U_2 respectively in one dimension, collide elastically. Derive the expressions for their final velocities V_1 or V_2.

(b) What are the Newton's rings? Derive the expression for the radius of the nth bright ring.
OR Define centripetal acceleration and centripetal force. Derive an expression for centripetal acceleration.

4.(a) Define Scalar and vector products and show that:
   (i) $\vec{A}\times\vec{B}=-\vec{B}\times\vec{A}$ (ii) $\vec{A}.(\vec{B}+\vec{C})=\vec{A}.\vec{B}+\vec{A}.\vec{C}$

(b) With the help of a ray diagram, describe the construction & working of an astronomical telescope & derive the formula for its magnifying power when focused for infinity.

5.(a) Define simple harmonic motion. A particle is its state of uniform circular motion. Prove that its projection along one of its diameter executes simple harmonic motion.

(b) Two bodies of unequal masses m_1 and m_2 ($m_1 > m_2$) are attached to the two ends of a string which passes over a frictionless pulley. If they are moving vertically, derive the expression for the tension in the string and the acceleration of the bodies.