BAHRIA FECHS GOVERNMENT DEGREE COLLEGE FOR WOMEN
PRELIMINARY EXAMINATION, 2022

Date: 06-03-2023 | PHYSICS PAPER – I | Max. Marks: 17
09:00 A.m. to 12:00 P.m. (Pre-Engineering & Pre-Medical Groups - Regular) | Time: 20 minutes

SECTION 'A' (MULTIPLE CHOICE QUESTIONS) – (M.C.Qs)

NOTE:

i) This section consists of 17-part questions, and all are to be answered. Each question carries one mark.
ii) Do not copy down the part questions in your answer book. Write only the answer in full against the proper number of the question and its part.
iii) The code number of your question paper is to be written in bold letters at beginning of answer script.

1. **Select the most appropriate answer for each from the given options:**

i) The dimension of G is ___.
* $M^{-1}L^3T^{-1}$ * $M^{-1}L^{-3}T^{-1}$ * $M^{-1}L^3T^{-2}$ * $M^{-1}L^3T^1$

ii) Chromatic aberration can be reduced by using a combination of ___.
* Two converging lenses * Two diverging lenses
* A converging lens and a diverging lens of different material * None of these

iii) If the length of a simple pendulum is increased 4 times, its period will be
* The same * Half * Double * Four times

iv) The length of the Galilean telescope is equal to :
* fo/fe * fo-fe * fe-fo * fo+fe

v) Which of the following equation represents Bragg's law?
* $m\lambda = 2d\sin\theta$ * $m\lambda = \frac{d\sin\theta}{2}$ * $2m\lambda = \sin\theta$ * $m\lambda = d\sin 2\theta$

vi) One Sone at 1000 Hz is equal to _____
* 60 dB * 40 dB * 30 dB * 100 dB

vii) The absolute P.E of a body of mass "m" in the Earth's gravitational field is given by ___.
* $-\frac{GMm}{r}$ * $-\frac{GMm}{r^2}$ * $GMm$ * $-\frac{GMm}{R_E}$

viii) In young's double slit experiments the condition for constructive interference for bright fringes is
* $S\sin\theta = \left(m+\frac{1}{2}\right)\lambda$ * $d\sin\theta = \left(m-\frac{1}{2}\right)\lambda$ * $d\sin\theta = m\lambda$ * $2d\sin\theta = m\lambda$

ix) An When the net torque acting on the system is zero, which of the following will be constant?
* Force * Angular Momentum * Liner Momentum * None of these

x) Which of following is not the unit of power?
* Kilowatt-hour * Horsepower * Foot-lb/sec * 1sec

xi) The weight of a man is 600N at the earth, his weight on the moon where g=g/6
*3600N *600N *300N *100N

xii) If the radius of the Earth was to shrink and their masses were to remain the same, the acceleration due to gravity on the surface of Earth will ___.
* Decreases * Remains same * Increases * None

xiii) The angle between centripetal acceleration and tangential acceleration is ___.
* 0° * 180° * 90° * 45°

xiv) The apparent weight of a person standing in an elevator which is moving down with uniform acceleration will be ___.
* Same as that on the surface of Earth * Greater than its weight on the surface of Ear
* Less than its weight on the surface of Earth * None of these

xv) A 1 kg stone when falling from a height of 10m, strikes the ground with velocity of ___.
* 10 m/s * 14 m/s * 98 m/s * 196 m/s

xvi) $\hat{j} \times \hat{j}$ is equal to ___.
* $\hat{j}^2$ * $\hat{j}$ * Zero * One

xvii) The area of a parallelogram formed by two vectors $\vec{A}$ & $\vec{B}$ is given by ___.
* $\frac{1}{2}\vec{A}.\vec{B}$ * $|\vec{A}\times\vec{B}|$ * $\frac{1}{2}|\vec{A}\times\vec{B}|$ * $\vec{A}.\vec{B}$

BANU BEGUM GOVERNMENT COLLEGE FOR WOMEN

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PHYSICS PAPER– 1

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09:00 A.m. to 12:00 P.m. (Pre-Engineering & Pre-Medical Groups - Regular) Time: 2 hours 40 minutes

SECTION 'B' (SHORT-ANSWER QUESTION) 40 marks

**Note:** Attempt any Ten-part questions from this section. All questions carry equal marks.

i) How artificial gravity is created in an orbiting spacecraft? Obtain the relevant expression for it.

ii) Define couple and show that magnitude of moment of couple is given by $\tau = Fd$ where the symbols have their usual meanings.

iii) Two thin convex lenses of focal length $f_1$ and $f_2$ are placed in contact. Derive the formula for the focal length of the combination. (OR)Show that rate of change of linear momentum is equal to force.

iv) Show that maximum range is four times the maximum height of projectile.

v) A wire hangs from a dark high tower so that the upper end is not visible. How can we determine the length of the wire.

vi) Two force $F_1$ and $F_2$ are acting on a body, the angle between them is $\theta$ .Assuming that $F_1$ is acting along x-axis, prove that the magnitude of force is equal to $\sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\theta}$

vii) Find how deep from the surface of Earth a point is where the acceleration due to gravity is half of the value on Earth's surface.

viii) Find the value of "p" for which the following vectors becomes perpendicular to each other.

$\vec{A} = 1 + p\hat{j} + 3\hat{k}$ $\vec{B} = 3\hat{i} + 3\hat{j} - 4\hat{k}$

ix) A car is waiting at a traffic signal and when it turns green, the car starts ahead with a constant acceleration of 3 m/s$^2$. At the same time a bus travelling with a constant speed of 20 m/s overtakes and passes the car.
(a)How far beyond its starting point will the car overtake the bus?
(b)How fast will the car be moving?

x) A horse pulls a cart horizontally with a force of 40N at an angle of 25° above the horizontal and moves along at a speed of 15m/s. How much work will the horse do in 5minutes? What is the power output of the horse? Give your answer in horsepower (1hp=746watt) ***(OR)*** Derive work energy equation.

xi) A ball of mass 0.2 kg is tied to the end of a circle and whirled in a horizontal circle of radius 0.4 m. If the ball makes 10 complete revolutions in 4 sec. find the linear speed, centripetal acceleration and centripetal force.
(OR) A 12 kg gun mounted on wheels shoots a 100gm projectile with a muzzle velocity 1800 m/sec of at an angle of 60° above the horizontal. Find the horizontal recoil velocity of the gun.

xii) A simple pendulum completes 4 vibrations in 8 sec on the surface of Earth. Find the time period on the surface of Moon where the acceleration due to gravity is one-sixth as that on Earth.

xiii) A note of frequency 500 Hz is being emitted by an ambulance moving onwards a listener at rest. If the listener detects a frequency of 526 Hz, calculate the speed of the ambulance. Take the speed of the sound at room temperature to be 340 m/s.

xiv) If the radius of the 14$^{th}$ bright Newton's ring is 1.0 mm when the light of wavelength 5.89 x 10$^{-7}$ m is used. What is the radius of curvature of the lower surface of the lens used? (0R) Can there be diffraction without interference and interference without diffraction?

xv) In a compound microscope, the focal lengths of the objective and the eye piece are 0.8 cm and 2.5 cm respectively. The real image formed by the objective is 16 cm from it. Determine the magnifying power of the microscope if the eye is held close to the eye piece and the image is formed at 25 cm from the eye piece.
(OR) A parallel beam of X-ray is diffracted by a crystal. The first order maximum is obtained when the glancing angle of incidence is 6, degrees 5 minutes. If the distance between the atomic planes of the crystal is 2.8 A°. Calculate the wavelength of the radiation.

## -SECTION "C"

## (DETAILED-ANSWER QUESTIONS) 28 Marks

Note: **Attempt any Two questions from this section. All questions carry equal marks.**

3. (a) A shell is fired with the velocity Vo at an angle θ with ground to hit the ground level target. Derive expressions for (i)) Height, (ii) Maximum range.
   (b) Show the variation of "g" with respect to altitude.
   **(OR)**Give the construction and working of Michelson's Interferometer. How it is used to determine the wavelength of a monochromatic light?

4. (a) What are standing waves? Derive expressions for the frequencies of vibration in a stretched string when it vibrates in: (i) One loop; (ii) Two loops; (iii) Three loops. Name the instrument used in the laboratory for studying such vibrations.
   (b) A particle is moving at a uniform speed along the circumference of a circle. The motion of its projection along one of its diameters is simple harmonic motion. Derive expressions for the Instantaneous and maximum velocity of the projection of a particle along one of the diameters of circle of reference
   *(OR)* What are the conditions for interference? Explain Young's double-slit experiment and obtain expressions for the position of bright and dark fringes.

5. (a) Two masses $m_1$ and $m_2$ are attached to the ends of a string which passes over a frictionless pulley such that they move vertically. Find the acceleration of the system and tension in the string.
   (b) Explain Newton's formula for the speed of sound in a material medium. Which factors forced Laplace to correct Newton's formula for speed of sound waves in a material medium? Explain Laplace correction
   (OR)What is Astronomical Telescope With the help of diagram describe the construction and working of an astronomical telescope and derive the formula for its magnification.