

# GOVERNMENT DEHLI COLLEGE

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PRELIMINARY EXAMINATIONS 2017

PHYSICS PAPER I

TIME: 03 HOURS

MAX. MARKS: 85

## SECTION "A"

(MULTIPLE CHOICE QUESTIONS)

(17 MARKS)

NOTE: Attempt all questions from this Section.

Q1. Choose the correct answer for each from the given options.

- i. If  $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$  then the angle between A and B is:   $90^\circ$  \*  $45^\circ$  \*  $15^\circ$  \*  $75^\circ$
- ii. An object of mass m fall freely with an acceleration "a", if the mass is increased by twice then the acceleration becomes:  a \* 2a \* 4a \* a/2
- iii. A light and a heavy body have equal momentum which one has greater kinetic energy?  Light body \* heavy body \* both have same kinetic energy \* none
- iv. At  $45^\circ$  the horizontal range of the projectile is:  
\* Four times the vertical height  twice the vertical height \* Thrice the vertical height \* Equal to the vertical height.
- v. Property of a body to oppose the accelerating torque is called:  
 moment of inertia \* inertia \* couple \* none
- vi. If the mass and weight of body is m and w at the surface of earth then its mass and weight at the surface of moon become:  m and w/6 \* m and 6w \* 6m and 6W \* all
- vii. The dimension of G is:   $L^3 M^{-1} T^{-2}$  \*  $M^2 L T^2$  \*  $M L^2 T^{-3}$  \*  $M^3 L^2 T^{-3}$
- viii. One million electron volt (1MeV) is equal to the \_\_\_\_\_ joule.   $1.6 \times 10^{-13}$  \*  $1.6 \times 10^{13}$  \*  $1.6 \times 10^{-19}$  \* none
- ix. A spring of force constant k is cut into three equal pieces, force constant of each part will be:  
 3k \* k/3 \* k \*  $k^3$
- x. The distance between successive node and antinode is:   $\lambda/4$  \*  $\lambda/2$  \*  $\lambda$  \*  $2\lambda$
- ix. Jet air craft (F-16) traveling supersonic speed in which:   $v_s > v$  \*  $v_s < v$  \*  $v = v_s$  \* none
- xii. If  $I/I_0 = 10^4$  then the intensity level in decibel is: \* 40  4 \* 400 \* all
- xiii. Because of phase reversal the conditions of interference are reversed in:  
\* Newton rings \* thin film  both \* none of these
- xiv. The new position of the wave front after time t can be obtain by drawing a plane tangential to the secondary wave lets. This known as:  Huygen's principle \* Bragg's law \* Snell law \* Maxwell law
- xv. The terrestrial telescope the third central lens is called:  
 erecting lens \* Optical lens \* objective lens \* Bifocal lens
- xvi. Which of the following quantities have same dimension:  
 torque & work \* power & energy \* stress & strain \* force & momentum
- xvii) If the magnification power of magnifying glass is 6 then its focal length is:  5 \* 6 \* 25 \* 4

## SECTION "B"

Q2. PROBLUMS AND REASONS (SHORT ANSWER QUESTIONS)

NOTE: Attempt any ten questions from this Section.

(40 MARKS)

- i) Give the Scientific reasons for any two of the following:
- a) Can the resultant of two vectors of the same magnitude be equal to the magnitude of either of the vectors?
- b) When the divers and acrobats wish to make several somersaults, why they pull their hands and feet close to their bodies?
- c) Is it possible for a body to have acceleration when moving with a: \* constant velocity \* constant speed.
- d) In the game of cricket why it is easy to catch the ball having high trajectory.
- ii) By using cross product show that  $\vec{A} = 4\hat{i} + 3\hat{j} - \hat{k}$  and  $\vec{B} = 8\hat{i} + 6\hat{j} - 2\hat{k}$  are parallel to each other.
- iii) A 50 gm bullet is fired into a 10 kg block that is suspended by a long cord so that it can swing as a pendulum. If the bullet is moving with the velocity 281.4m/sec penetrates into the suspended block. Calculate how much center of gravity of the block rises.
- iv) Calculate the mass of sun when earth is orbiting around the sun and complete one revolution in 365.30 days if the distance between centers of the earth and sun is  $1.49 \times 10^{11}m$ ,  $G = 6.67 \times 10^{-11} N \cdot m^2 / kg^2$
- v) A particle is in two dimensional motion in xy- plane having initial angle  $\theta$  with the x-axis. Show that its trajectory will be parabolic.

vi) A source of sound and a listener are moving towards each other with the velocity which are 0.5 times and 0.2 times then the speed of sound respectively if the source is emitting 2000 cps tone calculate the frequency heard by the listener.

OR

Two cars moving straight to each other from opposite directions with the same speed, the horn of one is blowing with frequency " $\nu$ " and is heard by the people twice in the other car. Find the speed of the cars, if the speed of sound in air is 340m/sec.

vii) A body of mass 0.025kg is attached to the end of the horizontal spring and displaced through 0.1m from mean position if  $k=0.4$  N/m and its velocity at the end of the displacement is 0.4m/sec calculate the:

(a) Total energy (b) Amplitude of its motion.

viii) What are standing waves derive the equation for standing wave when string vibrates in the form of one loop, two loops, three loops and n number of loops.

ix) If a diffraction grating produced a 1<sup>st</sup> order spectrum of light of wave length  $6 \times 10^{-7}$  m at an angle of  $20^\circ$  from the normal. What is its spacing and also calculate the number of lines per mm?

x) Microscope has an objective of 10mm focal length and eye piece of 25 mm focal length .what is the distance between the lenses and what the magnification is if the object is in sharp focus when it is 10.5mm from the objective.

xi) A body hanging from a spring is set into motion and the period of oscillation is found to be 0.50sec. after the body has come to rest, it is removed. How much shorter will the spring be when it come to rest?

xii) Explain the phenomenon of interference in time for two sound waves having small difference in frequencies. Also obtain the mathematical relation of frequency.

xiii) What happens if:

a) The speed of source is equal to the speed of sound b) The speed of source is greater than the speed of sound.

xiv) Derive work energy equation.

xv) The mass of Jupiter is 318 times of earth and has diameter 11 times as compared with that of earth find the value of g at Jupiter.

### Section # C

(Detail questions and answers)

**NOTE: Attempt any two questions from this Section.**

**(28 MARKS)**

3a) How many methods are there for vector addition? Describe the addition of two vectors by rectangular component method.

3b) Find out the equation for acceleration and tension if two bodies A & B are connected at the ends of the string when both bodies are moving vertically. If  $m_1=3m_2$  then show that both the bodies accelerate with  $4.9 \text{ m/sec}^2$ .

4a) A ladder with uniform density and mass " $m$ " rests against a frictionless vertical wall at an angle of  $60^\circ$ . The lower end rests on a flat surface where the coefficient of friction (static) is 0.40. A student with a mass ( $M=2m$ ) attempts to climb the ladder. What fraction of the length " $L$ " of the ladder will the student have reached when the ladder begins to slip?

OR

Give the working and equation for magnification power of Astronomical telescope or magnifying glass.

4b) What is Doppler Effect? Derive expressions for the apparent frequency of a sound when:

i. An observer moves towards a stationary source. ii. The source moves towards a stationary observer.

5a) Explain Newton formula for the speed of sound and describe Laplace's correction in it. Find the velocity of sound in air at  $0^\circ\text{C}$  if  $\gamma=1.40$  and  $R=8.314 \text{ J/mole}\cdot\text{K}$  and molecular mass of air is  $28.8 \text{ gm/mole}$ .

OR

Explain simple harmonic motion. Under what condition motion of simple pendulum is simple harmonic motion? Prove it mathematically and also find its frequency.

5b) How does Michelson interferometer differ with young double slit experiment. Derive expression for position of " $m$ " Bright fringe and fringe spacing.

OR

What is the main cause of weightlessness in space? Elaborate your answer with the reference of an elevator.