



SHIKSHA CLASSES

Subject : Physics

Question Paper

Total Marks :25

Class : XI

5 : Gravitation

Time : 1 Hour

SECTION - A

Q.1 : Choose the correct option : 4

- i) A satellite is orbiting around the Earth with a period T . If the Earth suddenly shrinks to half its radius without change in mass, the period of revolution of the satellite will be

- a) T b) $\frac{T}{2}$
c) $\frac{T}{\sqrt{2}}$ d) $2T$

- ii) A projectile is fired with a velocity less than the escape velocity. What can we say about the sum of its potential and kinetic energies?

- a) Negative b) Positive
c) Zero
d) May be +ve, -ve or zero

- iii) Acceleration due to gravity above the Earth's surface at a height equal to the radius of the Earth is -----.

- a) 2.5 m/s^2 b) 5 m/s^2
c) 9.8 m/s^2 d) 10 m/s^2

- iv) Weightlessness experienced while orbiting the earth in spaceship, is the result of:

- a) zero gravity b) centre of gravity
c) inertia d) acceleration

Q.2 : Answer the following : 2

- i) State Kepler's law of equal areas.
ii) State Kepler's law of period.

SECTION B

: Answer the following : (ANY 3) 6

Q.3 : Discuss the vector form of gravitational force between two masses with the help of diagram.

Q.4 : Derive the expression for the acceleration due to gravity on the surface of the Earth.

Q.5 : A body weighs 5.6 kg. wt on the surface of the Earth. How much will be its weight on a planet whose mass is $1/7^{\text{th}}$ mass of the Earth and radius twice of the Earth's radius?

Q.6 : At which place on the Earth's surface is the gravitational acceleration minimum? Why?

Q.7 : Write a short note on gravitational potential.

SECTION C

: Answer the following : (ANY 3) 9

Q.8 : Define escape speed. Derive an expression for the escape speed of an object from the surface of the Earth.

Q.9 : What is critical velocity? obtain satellite on what factors does it depend.

Q.10 : Calculate the Kinetic energy, potential energy, total energy and binding energy of an artificial satellite of mass 2000 kg orbiting at a height of 3600 km above the surface of the Earth. (Given : $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$ $R = 6400 \text{ km}$, $M = 6 \times 10^{24} \text{ Kg}$)

Q.11 : Obtain the formula for acceleration due to gravity at the depth ' d ' below the Earth's surface.

Q.12 : Calculate the height of the communication satellite.

(Given : $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{Kg}^2$, $M = 6 \times 10^{24} \text{ kg}$, $R = 6400 \text{ Km}$)

SECTION D

: **Answer the following : (ANY 1)** 4

Q.13: Derive an expression for variation in gravitational acceleration of the Earth with latitude.

Q.14: Explain how Newton conducted that

gravitational force $F \propto \frac{Mm}{r^2}$.

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