ETERNAL CAREER CLASSES

Gravitation

1. A particle of mass M is situated at the centre of spherical shell of mass and radius a. The magnitude of the gravitational potential at a point situated at $\frac{a}{2}$ distance from the centre will be

(a) $\frac{2GM}{a}$ (b) $\frac{3GM}{a}$

(c) $\frac{4GM}{a}$ (d) $\frac{GM}{a}$

2. The height at which the weight of a body becomes 1/16th its weight on the surface of earth (radius R) is

(a) 4R (b) 5R

(c) 15R (d) 3R

3. A spherical planet has a mass M_p and diameter D_p. A particle of mass m falling freely near the surface of this planet will experience an acceleration due to gravity equal to

(a) $4Gm_p\ m/D_p^2$ (b) $4Gm_p/D_p^2$

(c) $Gm_p\ m/D_p^2$ (d) Gm_p/D_p^2

4. A geostationary satellite is orbiting the earth at a height of 5R above the surface of the earth, R being the radius of the earth. The time period of another satellite in hours at a height of 2R from the surface of the earth is

(a) $\frac{6}{\sqrt{2}}$ (b) 5

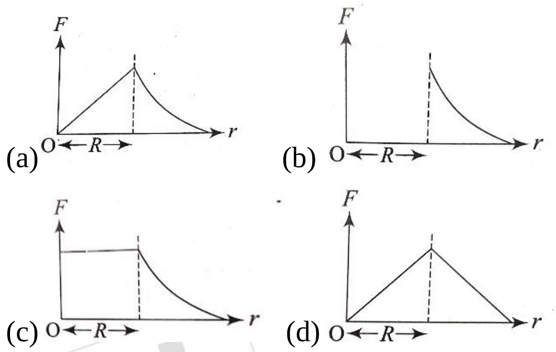
(c) 10 (d) $6\sqrt{2}$

5. If v_e is escape velocity and v_0 is orbital velocity of a satellite for orbit close to the Earth's surface, then these are related by

(a) $v_e = \sqrt{2}\ v_e$ (b) $v_0 = v_e$

(c) $v_e == \sqrt{2v_0}$ (d) $v_e = \sqrt{2}\ v_0$

6. Which one of the following plots represents the variation of gravitational field on a particle with distance r due to a thin spherical shell of radius R ? (r is measured from the centre of the spherical shell)



7. A body of mass m taken from the earth's surface to the height is equal to twice the radius (R) of the earth. The change in potential energy of body will be

(a) mg2R (b) $\frac{2}{3}$ mgR

(c) 3mgR (d) $\frac{1}{2}$ mgR

8. Infinite number of bodies, each of mass 2 kg, are situated on x-axis at distance 1m, 2m, 4m, 8m, …… respectively, from the origin. The resulting gravitational potential due to this system at the origin will be

(a) – G (b) $-\frac{8}{3}$ G

(c) $-\frac{4}{3}$ G (d) – 4G

9. A projectile is fired from the surface of the earth with a velocity of 5 ms^{-1} and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 ms^{-1} at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in ms^{-2}) is (given g = 9.8ms^{-2})

(a) 3.5 (b) 5.9

(c) 16.3 (d) 110.8

10. A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would earth (mass = 5.98×10^{24}) have to be compressed to be a black hole ?

(a) 10^{-9} m (b) 10^{-6} m

(c) 10^{-2} m (d) 100 m