



General Instructions

- (i) **Duration:** The total duration of the examination is 3 hours (180 minutes).
- (ii) **Total Marks:** The complete paper carries a maximum of 300 marks.
- (iii) **Structure:** The paper has 3 part and each consists of two sections:
 - **Section A:** 20 Multiple Choice Questions (MCQs).
 - **Section B:** 5 Numerical Value Type Questions.
- (iv) **Compulsory Questions:** All 75 questions are compulsory.
- (v) Each question has four options. Only **one** option is correct.
- (vi) **Correct Answer:** +4 marks.
- (vii) **Incorrect Answer:** –1 mark (Negative marking).
- (viii) **Unanswered/Marked for Review:** 0 marks.

Physics

1. Potential energy of a particle is given as $u = \frac{A\sqrt{x}}{B+x}$. Find dimension of A and B :-

- (1) $M^3L^{3/2}T^{-2}$, L
- (2) $M L^{5/2}T^{-1}$, L^2
- (3) $ML^{5/2}T^{-2}$, L
- (4) $ML^{7/2}T^{-3}$, L

2. In AC circuit supply voltage (V_{rms}) = 1000V, $R = 80\ \Omega$, $X_L = 80\ \Omega$ & source frequency $f = 50\text{ Hz}$.

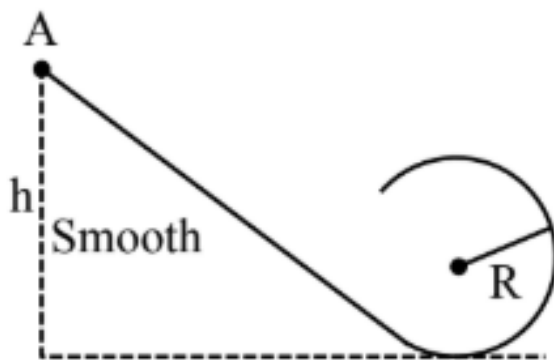
Find the power factor.

- (1) $\frac{1}{\sqrt{2}}$
 - (2) $\frac{1}{\sqrt{3}}$
 - (3) $\frac{1}{\sqrt{5}}$
 - (4) $\frac{1}{\sqrt{6}}$
-

3. Electric field due to half Ring at center is 100 N/C. Find charge on Ring. Radius of Ring is 10cm.

- (1) $\frac{\pi}{9} \times 10^{-9}\text{ C}$
 - (2) $\frac{\pi}{27} \times 10^{-9}\text{ C}$
 - (3) $\frac{\pi}{18} \times 10^{-9}\text{ C}$
 - (4) $\frac{\pi}{36} \times 10^{-9}\text{ C}$
-

4. A particle is released from point A of track as shown in figure find h so that normal reaction at highest point is 3 times the weight of block :-



- (1) $h = 4R$
 - (2) $h = 3R$
 - (3) $h = 2.5R$
 - (4) $h = 6R$
-

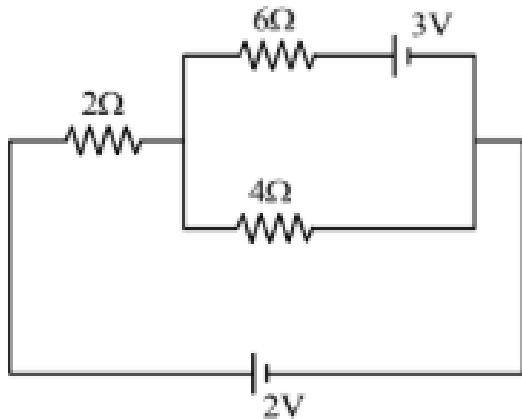
5. Find transverse magnification due to curved boundary between two mediums. $n_1 = 1$, $n_2 = 1.4$, and the object is at a distance $4R$ from the pole.

- (1) ~ 1.5
 - (2) ~ 1.67
-

(3) +1.2

(4) ~ 0.8

6. Find heat dissipated in 6Ω resistance in 100 seconds.



(1) 31 J

(2) 35 J

(3) 40 J

(4) 28 J

7. In YDSE a glass slab of thickness $8\mu\text{m}$ is introduced in front of a slit. If central maxima shifts to the position of 4th minima, then find refractive index of glass slab ($\lambda = 500\text{ nm}$):-

(1) $\mu = 1.11$

(2) $\mu = 1.22$

(3) $\mu = 1.32$

(4) $\mu = 1.22$

8. A particle is performing SHM of amplitude A. Find the time required for particle to go from mean position to $\frac{A}{\sqrt{2}}$. Time period of SHM is 5 secs :-

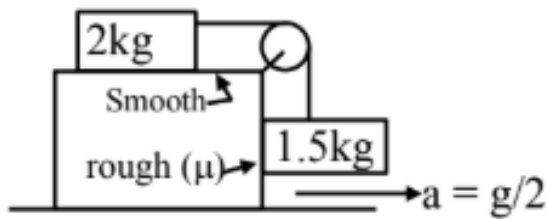
(1) $5/4$ sec.

(2) $5/12$ sec.

(3) $5/8$ sec.

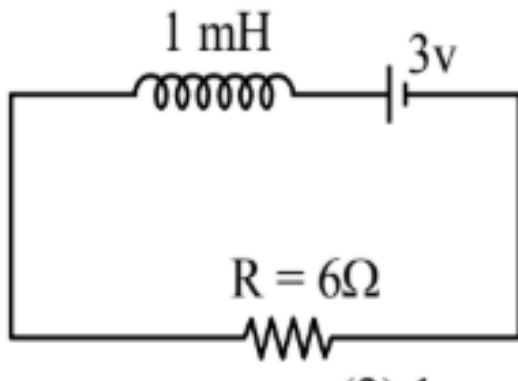
(4) $5/6$ sec.

9. Find μ so that blocks are at rest :



- (1) $1/3$
- (2) $2/3$
- (3) $1/4$
- (4) $1/2$

10. For the given circuit, find ratio of instantaneous voltage across inductor when current is 2mA & when current is 4mA.



- (1) 1.5
- (2) 1
- (3) 2
- (4) 1.25

11. A sphere of mass 5 kg and radius 4 cm is rotating about fixed axis about diameter with 1200 r.p.m. To stop it in 10 sec, a torque is applied. Find magnitude of torque required and revolution made before it stops. Respectively :-

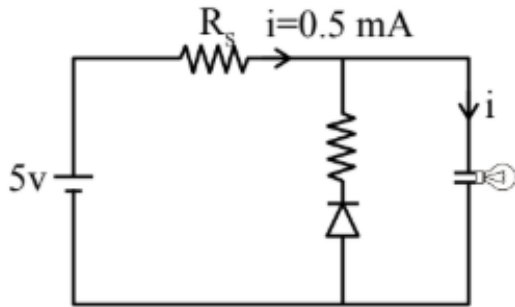
- (1) 0.08 N-m and 50 Rev.
- (2) 0.04 N-m and 100 Rev.
- (3) 0.016 N-m and 200 Rev.
- (4) 0.2 N-m and 100 Rev.

12. Intensity of two sources is same and path difference at point A and B are $\frac{\lambda}{6}$ and $\frac{\lambda}{3}$ respectively.

Ratio of intensity at A & B will be.

- (1) 3
 - (2) 4
 - (3) $1/3$
 - (4) $1/4$
-

13. Find minimum R_s so that LED light does not get damaged (power rating of LED is 2 mW):-



- (1) 1Ω
 - (2) 2Ω
 - (3) 3Ω
 - (4) 4Ω
-

14. The dimension of a solid cylinder is measured as given Mass = $19.42 \pm 0.02 \text{ kg}$, Diameter = $20.20 \pm 0.02 \text{ cm}$, Length = $10.10 \pm 0.02 \text{ cm}$. Find out % error in density.

- (1) 0.5%
 - (2) 0.3%
 - (3) 0.4%
 - (4) 0.7%
-

15. Electric field in space is given by $\vec{E} = 2x\hat{i} + 3y^2\hat{j} + 4\hat{k}$. A charge $q = 3\text{C}$ is taken from $r_i(0, -1, -3)$ to $r_f(5, 1, 2)$. Find magnitude of ΔU

16. Bulk's modulus of an ideal gas for isothermal process initially is B. Gas is compressed from volume V_0 to $\frac{V_0}{3}$ isothermally. Find the work done by gas.

- (1) $BV_0 \ln 3$
 - (2) $\frac{BV_0}{3} \ln 3$
-

- (3) $BV_0 \ell n(1/3)$
(4) $3BV_0 \ell n(1/2)$
-

17. A cube of side 1mm is placed at centre of circular coil of radius 10cm. current flowing in coil is 2A. Find magnetic field energy stored in cube. ($\pi = 3.14$)

- (1) $1.57 \times 10^{-14} \text{ J}$
(2) $6.28 \times 10^{-14} \text{ J}$
(3) $12.56 \times 10^{-14} \text{ J}$
(4) $9.42 \times 10^{-14} \text{ J}$
-

18. Unpolarised light with intensity I_0 , incident on polariser. Find angle between axis of polarises and analyser so that intensity of emergent light becomes $\frac{3I_0}{8}$:-

- (1) 60°
(2) 30°
(3) 90°
(4) 0°
-

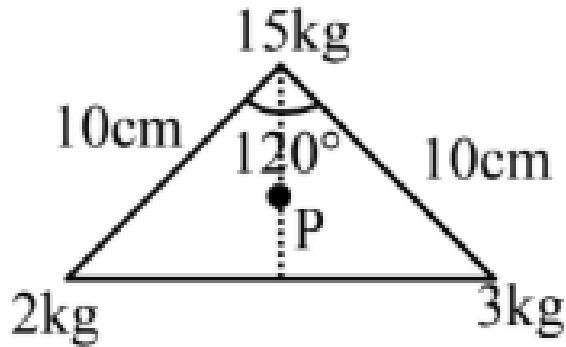
19. Shortest wavelength of Lyman is x, then difference of wavelengths of 1st Balmer and 2nd Balmer line is terms of x will be :-

- (1) $(28/15)x$
(2) $(26/15)x$
(3) $(13/15)x$
(4) $(11/15)x$
-

20. A small drop of mass 1 gm starts falling from rest from a height of 1 km. When it reaches the ground with speed of 5 m/s, magnitude of work done by resistance force is $x \times 10^{-3} \text{ J}$. Find x :-

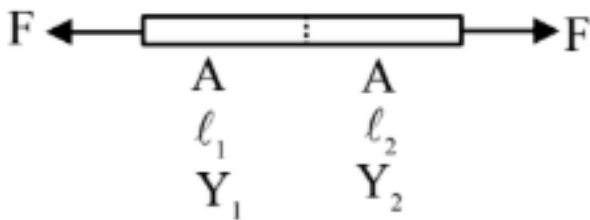
- (1) 845
(2) 247.5
(3) 987.5
(4) None
-

21. If P is the midpoint of median. Find distance of COM from P



- (1) 6.18
- (2) 5.18
- (3) 6.88
- (4) 1.32

22. Two wires are joint together and is elongated with force as shown in figure. If $\frac{Y_1}{Y_2} = \frac{20}{11}$. Find out $\frac{\ell_1}{\ell_2}$ so that they have same elongation.

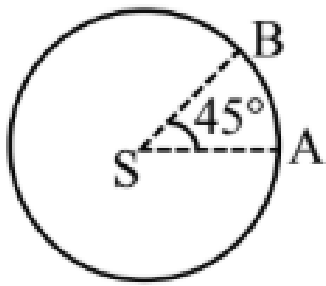


- (1) 11/20
- (2) 20/11
- (3) 11/10
- (4) 10/11

23. Find the ratio of momentum of photons of 1st & 2nd line of Balmer series of hydrogen atom.

- (1) 10/20
- (2) 11/27
- (3) 15/20
- (4) 20/27

24. A point source is kept at center of sphere. The intensity of light at point A is I, then intensity at point B is :



- (1) $I/2$
 - (2) $2I$
 - (3) I
 - (4) $I/3m$
-