MEMORY BASED QUESTIONS JEE–MAIN EXAMINATION – JANUARY 2026

(HELD ON THURSDAY 22nd JANUARY 2026) **TIME : 9:00 AM TO 12:00 NOON**

PHYSICS

TEST PAPER WITH SOLUTION

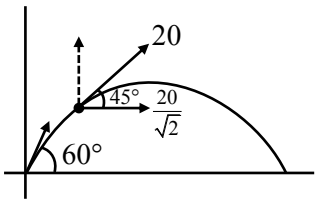
1. A particle is projected at an angle of 60° with the ground. When projectile makes an angle 45° with the horizontal, its speed becomes 20 m/s, then initial velocity is :

(1) $20\sqrt{2}$ m/s (2) $10\sqrt{2}$ m/s

(3) $5\sqrt{5}$ m/s (4) $10\sqrt{5}$ m/s

Ans. **(1)**

Sol.



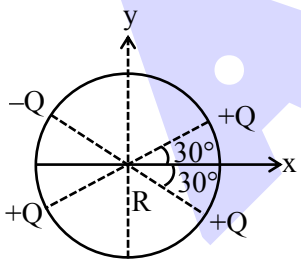
$$u\cos 60° = \frac{20}{\sqrt{2}}$$

$$\frac{u}{2} = \frac{20}{\sqrt{2}}$$

$$u = \frac{40}{\sqrt{2}}$$

$$u = 20\sqrt{2} \text{ m/s}$$

2. Find electric field intensity $\vec{E}$ at centre of circle :

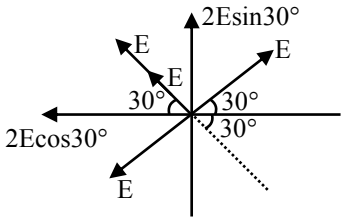


(1) $\frac{KQ}{R^2}\hat{i} + \frac{KQ}{R^2}\hat{j}$ (2) $\frac{-\sqrt{3}KQ}{R^2}\hat{i} + \frac{KQ}{R^2}\hat{j}$

(3) $\frac{KQ}{R^2}\hat{i} + \frac{\sqrt{3}KQ}{R^2}\hat{j}$ (4) $\frac{\sqrt{3}KQ}{R^2}\hat{i} + \frac{\sqrt{3}KQ}{R^2}\hat{j}$

Ans. **(2)**

Sol.

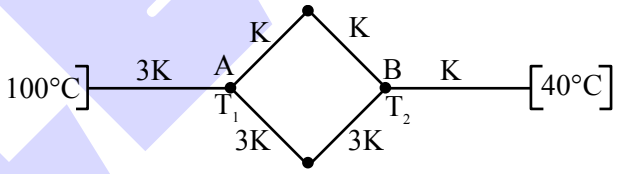


$\left[E = \frac{kQ}{R^2}\right]$

$$\vec{E}_{net} = 2E\cos 30°\left(-\hat{i}\right) + 2E\sin 30°\left(\hat{j}\right)$$

$$\frac{-\sqrt{3}kQ}{R^2}\left(\hat{i}\right) + \frac{kQ}{R^2}\left(\hat{j}\right)$$

3. As shown in the figure, six rods of same geometry are connected, and maintained at temperatures 100°C and 40°C. The temperature at points A and B are :



(1) T_A =73°C, T_B = 89°C

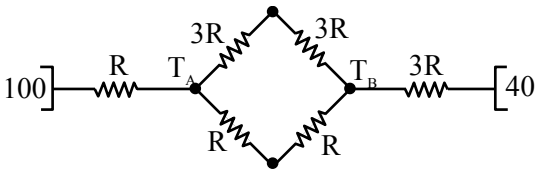
(2) T_A =85°C, T_B = 75°C

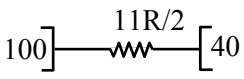
(3) T_A =89°C, T_B = 73°C

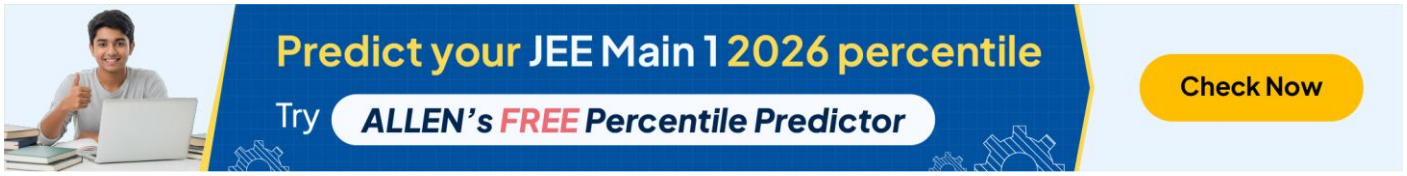
(4) T_A =74°C, T_B = 88°C

Ans. **(3)**

Sol. Let $\left[R = \frac{\ell}{3KA}\right]$







$$\left[H=\frac{100-40}{\frac{11R}{2}}\right] \ldots (1)$$

$$=\frac{100-T_A}{R} \ldots\ldots (2)$$

$120 = 1100 - 11T_A$

using (1) and (2)

$T_A = 89°C$

$$=\frac{T_B-40}{3R}$$

using (1) and (3)

$T_B = 73°C$

4. A convex lens of focal length 5 cm and a concave lens of focal length 4 cm are placed in contact and a point object is placed at 10 cm from system. In this arrangement magnification is m_1. Now keeping system as it is concave lens is moved 1 cm away and now magnification becomes m_2. Find m_1/m_2 :

(1) 5/6

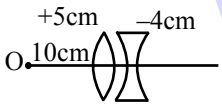
(2) 4/7

(3) 6

(4) 7

Ans. (1)

Sol. Initial configuration



$$\frac{1}{f}=\frac{1}{5}-\frac{1}{4}=-\frac{1}{20}$$

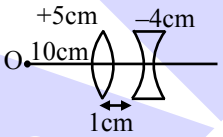
$f = -20$ cm

$u = -10$cm

$$\frac{1}{v}-\frac{1}{u}=\frac{1}{f}$$

$$v=\frac{uf}{u+f}$$

New configuration



1st refraction

$u = -10$ cm, $f = +5$cm

$$v=\frac{uf}{u+f}=+10\text{cm}$$

$m = -1$

2nd refraction

$$m_1=\frac{v}{u}=\frac{f}{u+f} \qquad u=+9\text{cm}\ f=-4\text{cm}$$

$$m'=\frac{f}{u+f}=\frac{-4}{5}$$

$$=\frac{-20}{-10-20} \qquad m_2=mm'=(-1)\left(-\frac{4}{5}\right)=\frac{4}{5}$$

$$=+\frac{2}{3} \qquad \frac{m_1}{m_2}=\frac{2}{3}\times\frac{5}{4}=\frac{5}{6}$$

5. Escape velocity from a planet of radius R and density ρ is given as 10 km/s. Find the escape velocity from a planet of radius $\frac{R}{10}$ and density $\frac{\rho}{10}$:

(1) $10\sqrt{100}$ m/s

(2) $110\sqrt{10}$ m/s

(3) $100\sqrt{10}$ m/s

(4) $90\sqrt{10}$ m/s

Ans. (3)

Sol. $V_e = 10$ km/s $= 10^4$ m/s

$$\Rightarrow \sqrt{\frac{2GM}{R}}=10^4$$

$$\sqrt{\frac{2G\left(\rho\frac{4}{3}\pi R^3\right)}{R}}=10^4$$

$$\Rightarrow \sqrt{\frac{8}{3}G\rho\pi R^2}=10^4 \qquad \ldots(i)$$

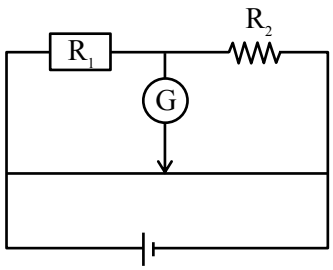
$$v_e'=\sqrt{\frac{2GM'}{R'}}=\sqrt{\frac{2G\rho}{10}\frac{4\pi}{3}\left(\frac{R}{10}\right)^3}{\frac{R}{10}}$$

$$v_e'=\sqrt{\frac{8G}{3}\frac{\rho\pi R^2}{10^3}}=\frac{v_e}{\sqrt{10^3}}$$

$$v_e' = \frac{10^4}{\sqrt{10^3}} = 10^{(4-3/2)} = 10^{5/2}$$

$$v_e' = 100\sqrt{10}\,m/s$$

6. Figure shows a meter bridge



Initially null point was achieved at a distance of 40 cm. When a resistance 16 Ω is attached in parallel with R_2, new balance point was achieved at 50 cm. Then find value of R_1 and R_2 :

(1) $R_1 = 8\Omega, R_2 = \frac{16}{3}\Omega$

(2) $R_1 = 16\Omega, R_2 = 8\Omega$

(3) $R_1 = \frac{16}{3}\Omega, R_2 = 8\Omega$

(4) $R_1 = 8\Omega, R_2 = 16\,\Omega$

Ans. **(3)**

Sol. Initially :

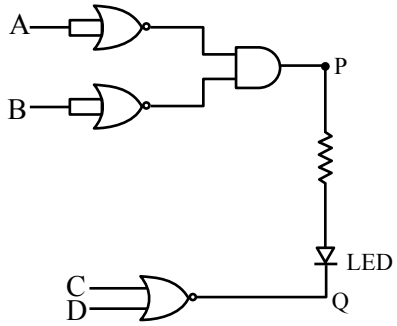
$$\frac{R_1}{R_2} = \frac{40}{60} = \frac{2}{3} \Rightarrow R_1 = \frac{2}{3}R_2$$

Again

$$\frac{R_1}{\frac{16R_2}{16+R_2}} = 1 \Rightarrow \frac{2}{3}R_2 = \frac{16R_2}{16+R_2} \Rightarrow R_2 = 8\Omega$$

$$\therefore R_1 = \frac{16}{3}\Omega$$

7. In the figure the LED will glow for input of A, B, C, D : (0 is low potential and 1 is high potential)



(1) 0 0 10 (2) 0 0 0 0

(3) 1 1 0 0 (4) 1 0 0 0

Ans. **(1)**

Sol. LED will glow in forward biasing :

P higher potential – 1

Q lower potential – 0

8. A closed tube filled with ideal gas is rotating with 'ω' along axis passing through end A. Find pressure at other end B (M is molar mass of the gas, ℓ is length of tube and T is the temperature of gas) :

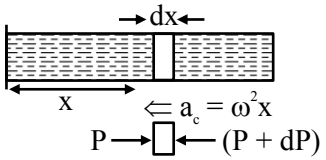
Given pressure at 'A' is P_A :

(1) $P_A e^{\frac{\omega^2\ell^2 M}{2RT}}$ (2) $P_A e^{\frac{\omega^2\ell^2 M}{RT}}$

(3) $P_A e^{\frac{\omega^2\ell^2 M}{3RT}}$ (4) $P_A e^{\frac{\omega^2\ell^2 M}{4RT}}$

Ans. **(1)**

Sol.



$$A[(P + dP) - P] = (dm)(\omega^2 x)$$

$$dP = \frac{(dm)}{A}\omega^2 x$$

$$dP = \frac{(\rho)(A)(dx)\omega^2 x}{A}$$

also [PM = ρRT]

$$\rho = \frac{PM}{RT}$$

$$dP = \left(\frac{PM}{RT}\right)\omega^2 x dx$$

$$\int_{P_A}^{P_B} \frac{dP}{P} = \frac{\omega^2 M}{RT}\int_0^{\ell} x dx$$

$$\ell n\left(\frac{P_B}{P_A}\right) = \frac{\omega^2 \ell^2 M}{2RT}$$

$$P_B = P_A e^{\frac{\omega^2 \ell^2 M}{2RT}}$$

9. For an ideal gas in a reversible process ($\Delta Q = 0$), volume becomes 8 times and temperature becomes $\frac{1}{4}$ times the initial value. Identify the gas :

(1) CO_2

(2) O_2

(3) NH_3

(4) He

Ans. (4)

Sol. PV^{γ} = constant

$TV^{\gamma-1}$ = constant

$$TV^{\gamma-1} = \left(\frac{T}{4}\right)(8V)^{(\gamma-1)}$$

$$4 = 8^{(\gamma-1)}$$

$$2^2 = 2^{3\gamma-3}$$

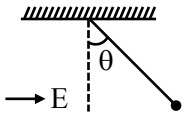
$$2 = 3(\gamma-1)$$

$$\gamma = \frac{5}{3}$$

Gas is a monoatomic gas

Answer is He.

10. A simple pendulum with bob of mass m carrying charge q is in equilibrium in presence of horizontal electric field E, then tension in the thread is :



(1) $T = \sqrt{(qE)^2 + (mg)^2}$

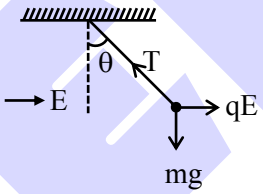
(2) $T = mg + qE\tan\theta$

(3) $T = \sqrt{(qE)^2 - (mg)^2}$

(4) $T = mg - qE\tan\theta$

Ans. (1)

Sol.



$$T = \sqrt{(qE)^2 + (mg)^2}$$

11. There is a glass sphere of refractive index 1.5, on which a parallel beam of light falls. Find distance of final converging point of final emergent ray from centre of the sphere. Radius of sphere is 50 cm :

(1) 75 cm

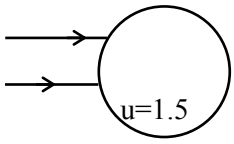
(2) 70 cm

(3) 80 cm

(4) 65 cm

Ans. (1)

Sol.



1st refraction

$$\frac{1.5}{v}-\frac{1}{\infty}=\frac{1.5-1}{+50}$$

$$\frac{1.5}{v}=\frac{1}{100}\Rightarrow v=150\text{cm}$$ or

= 50 cm from 2nd surface

2nd refraction

$$\frac{1}{v}-\frac{1.5}{+50}=\frac{1-1.5}{-50}$$

$$=-2$$

$$\frac{1}{v}=\frac{1}{100}+\frac{3}{100}$$

$$=\frac{4}{100}$$

v = 25 cm

$\therefore$ Distance from centre = 75 cm

12. **Statement-1 :** Liquid pressure is only exerted on solid surface in contact and is exerted in between the layers of liquid.

Statement-2 : Surface tension arises due to difference in potential energy of molecules in bulk of liquid and at surface.

(1) Both **Statement-1** and **Statement-2** are incorrect.

(2) **Statement-1** is correct but **Statement-2** is incorrect.

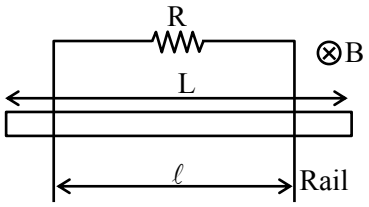
(3) **Statement-1** is incorrect but **Statement-2** is correct.

(4) Both **Statement-1** and **Statement-2** are correct.

Ans. **(4)**

Sol. Theory

13. A rod of mass 'm' and length 'L' is released on a rail placed in uniform magnetic field B. What will be the terminal velocity of rod :

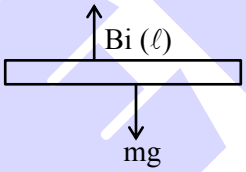


(1) $\frac{mgR}{B^2L^2}$ (2) $\frac{mgR}{B^2\ell^2}$

(3) $\frac{mgR}{B\ell^2}$ (4) $\frac{mg}{B^2\ell^2R}$

Ans. **(2)**

Sol. Terminal velocity



$$i=\frac{(B)(v)(\ell)}{R}$$

$$B(i)(\ell)=mg$$

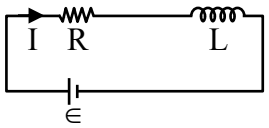
$$B\left[\frac{Bv\ell}{R}\right]\ell=mg$$

$$\frac{B^2\ell^2v}{R}=mg$$

$$v=\frac{mgR}{B^2\ell^2}$$

14. Find energy density at the instant current is $\frac{1}{e}$ times maximum value. If value is $\alpha\frac{\pi}{e^2}$. Find α.

(Given : $\in$ = 10 volt, R = 10Ω, L = 10 mH, $\frac{N}{\ell}=10000$.)



Ans. 20

Sol. $\frac{I_0}{e}=I=I_0(1-e^{-Rt/L})$, where $I_0=\in/R$

Energy density $=\frac{1}{2}\frac{B^2}{\mu_0}=\frac{1}{2\mu_0}(\mu_0 nI)^2$

$=\frac{1}{2}\mu_0 n^2 I^2$

$=\frac{1}{2}\mu_0 n^2\frac{I_0^2}{e^2}$

$=\frac{1}{2}(4\pi)(10^{-7})(10000)^2\left(\frac{10}{10}\right)^2\frac{1}{e^2}$

$=2\times10^{+1}\times\left(\frac{\pi}{e^2}\right)$

$\frac{\alpha\pi}{e^2}=20\left(\frac{\pi}{e^2}\right)\Rightarrow\ \alpha=20$

15. The energy required to excite electron from first Bohr's orbit of Hydrogen atom to second Bohr's orbit in J is :

(1) 1.634×10^{-18} J (2) 1.2×10^{-18} J

(3) 0.2×10^{-18} J (4) 1.2×10^{-20} J

Ans. (1)

Sol. $E_n=\frac{-13.6}{n^2}$eV

$\Rightarrow n=1;\ E_1=-13.6$ eV

$\Rightarrow n=2;\ E_2=\frac{-13.6}{2^2}=-3.4$eV

$\Delta E=E_2-E_1=-3.4-(-13.6)$

$=10.2$ eV

$\Delta E=10.2\times1.6\times10^{-19}$

$\Delta E=1.634\times10^{-18}$ J

16. A photon is incident on particle having mass m = 15.356 amu. What should be the frequency of photon so that particle of mass 'm' breaks into four α-particles :

(given : m_α = 4.004 amu ;h = 6.6×10^{-34} Js)

(1) 14.9×10^{19} kHz

(2) 12.9×10^{19} kHz

(3) 9.9×10^{19} kHz

(4) 10.9×10^{19} kHz

Ans. (1)

Sol. hv = (4 × 4.004 – 15.356) amu $\times c^2$

$v=\frac{0.66}{h}\times931\times10^6$eV

v = 14.9×10^{19} kHz

17. Match the following :

(1)	Spring constant	(i)	$ML^2T^{-2}K^{-1}$
(2)	Thermal Conductivity	(ii)	$MLT^{-3}K^{-1}$
(3)	Boltzman constant	(iii)	ML^0T^{-2}
(4)	Inductance	(iv)	$ML^2T^{-2}A^{-2}$

(1) (1) → (ii), (2) → (iii), (3) → (i), (4) → (iv)

(2) (1) → (iii), (2) → (i), (3) → (ii), (4) → (iv)

(3) (1) → (i), (2) → (ii), (3) → (iii7), (4) → (iv)

(4) (1) → (iii), (2) → (ii), (3) → (i), (4) → (iv)

Ans. (4)

Sol. F = K.x

K = F/x

$[K]=\frac{[MLT^{-2}]}{[L]}=MT^{-2}$ (iii)

(A) → (iii)

(B) Thermal conductivity : $\left[MLT^{-3}K^{-1}\right]\rightarrow$(ii)

(C) Boltzman constant : $\left[ML^2T^{-2}K^{-1}\right]\rightarrow$(i)

(D) Inductance : $\left[ML^2T^{-2}A^{-2}\right]\rightarrow$(iv)

18. An α-particle is projected towards a fixed gold nucleus (Z = 79) with kinetic energy 7.9 MeV. If particle is just able to touch the nucleus boundary. Find diameter of nucleus :

(1) 57.6 fm (2) 45.6 fm

(3) 36.6 fm (4) 20.6 fm

Ans. **(1)**

Sol. $K_f + U_i = K_f + U_f$

$$7.9\text{ MeV} + 0 = 0 + \frac{K.Qq}{r}$$

$$7.9\times10^{6}\times e = \frac{9\times10^{9}\times 79e.2e}{r}$$

$$r = 9\times10^{3}\times10\times2\times1.6\times10^{-19}$$

$$= 28.8\times10^{-15} = 2.88\times10^{-14}\text{ m}$$

$$d = 2r = 5.76\times10^{-14}\text{ m}$$

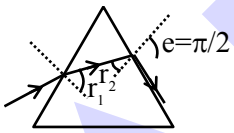
$$= 57.6\text{ fm}$$

19. A ray of light is incident at angle of incidence 'i' on an equilateral prism. If the ray emerges grazing the second surface, find angle of refraction (in degree) at first surface. Refraction index is $\sqrt{2}$.

Ans. **(15)**

Sol. Equilateral prism.

$A = 60°$



$\mu \text{Sin} r_2 = 1.\text{sine} = 1$

$$\text{Sin} r_2 = \frac{1}{\mu} = \frac{1}{\sqrt{2}}$$

$r_2 = 45°$

$\therefore r_1 = A - r_2 = 15°$

20. Two discs having same moment of inertia about their axis. Their thicknesses are t_1 and t_2 and they have same density. If $R_1/R_2 = 1/2$, then find t_1/t_2 :

(1) 1/16 (2) 16

(3) 1/4 (4) 4

Ans. **(2)**

Sol. $I_1 = I_2$

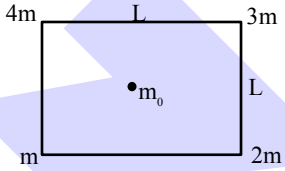
$$\frac{M_1R_1^2}{2} = \frac{M_2R_2^2}{2}$$

$$\rho\frac{\pi R_1^2 t_1 R_1^2}{2} = \rho\frac{\pi R_2^2 t_2 R_2^2}{2}$$

$$\frac{t_1}{t_2} = \frac{R_2^4}{R_1^4} = 2^4$$

$$\frac{t_1}{t_2} = 16$$

21. If initially force on $m_0 = F_0$. When position of 4m & 3m are interchanged, force become F'. If $F_0/F' = \alpha/\sqrt{5}$. Find α :

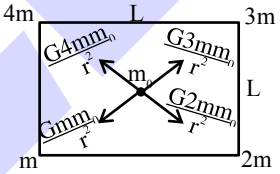


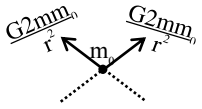
(1) 1 (2) 2

(3) 3 (4) 4

Ans. **(2)**

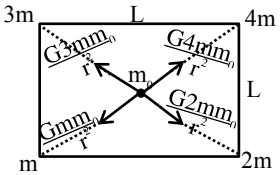
Sol. Initial configuration

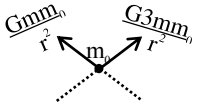




$$F = 2\sqrt{2}\frac{Gmm_0}{r^2}$$

New configuration



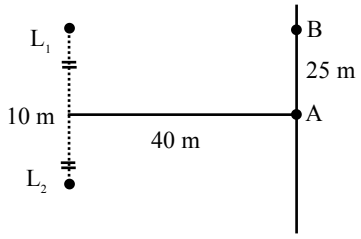


$$F' = \sqrt{10}\frac{Gmm_0}{r^2}$$

$\Rightarrow \frac{F}{F'} = 2\sqrt{2}.\frac{1}{\sqrt{10}} = \frac{2}{\sqrt{5}}$

$\therefore \alpha = 2$

22. Two coherent loudspeaker L_1 and L_2 are placed at separation of 10 m parallel to the wall at distance 40 m as shown in the figure. On width AB on the wall, 10 maximas and minimas are found. If velocity of sound is 324 m/s. find frequency of sound ($\sqrt{5} = 2.23$) :



(1) 600 Hz (2) 500 Hz

(3) 400 Hz (4) 700 Hz

Ans. **(1)**

Sol. $L_1B = \sqrt{20^2 + 40^2} = 20\sqrt{5}m = 44.6m$

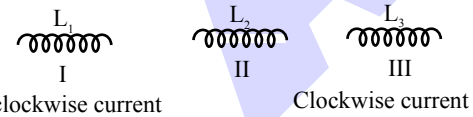
$L_2B = \sqrt{30^2 + 40^2} = 50m$

$\Delta x = 50 - 44.6 = 5.4\ m = 10\lambda$ for 10 cycles

$\lambda = 0.54\ m$

$f = \frac{v}{\lambda} = \frac{324}{0.54} = 600Hz$

23. As shown three coils are given having equal current in first and last coil, choose the correct option for the 2nd inductor to have clockwise current :



Anti-clockwise current Clockwise current

(1) Move L_1 to words L_2 & L_3 away from L_2.

(2) Move L_1 away from L_2 & L_3 away from L_2.

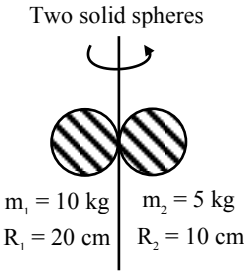
(3) Move L_1 to words L_2 & L_3 towards L_2.

(4) Move L_1 away from L_2 & L_3 towards L_2.

Ans. **(1)**

Sol. Theory

24. Find the moment of inertia about given axis.



(1) 0.63 kg m^2 (2) 0.61 kg m^2

(3) 0.62 kg m^2 (4) 0.60 kg m^2

Ans. **(1)**

Sol. $I = \frac{2}{5}m_1R_1^2 + m_1R_1^2 + \frac{2}{5}m_2R_2^2 + m_2R_2^2$

$= \frac{7}{5}\left[m_1R_1^2 + m_1R_2^2\right]$

$= \frac{7}{5}\left[10\times(20)^2 + 5(10)^2\right]\times10^{-4}$

$= \frac{7}{5}\left[10\times4 + 5\right]\times10^2\times10^{-4}$

$= \frac{7}{5}\times45\times10^{-2}$

$I = 63 \times 10^{-2}$ kg m^2

$I = 0.63$ kg m^2

25. If potential is v = 500 volts at (10, 20) and electric field given $\vec{E} = 10x\hat{i} + 5y\hat{j}\ N/C$. Find potential at origin.

(1) 1000 volt (2) 2000 volt

(3) 1500 volt (4) 3000 volt

Ans. **(2)**

Sol. $\Delta V = -\int \vec{E}.d\vec{r}$

$V_{(10,20)} - V_{(0,0)} = -\int_{(0,0)}^{(10,20)} (10xdx + 5ydy)$

$500 - V = -\left[5x^2 + \frac{5}{2}y^2\right]_{0,0}^{10,20}$

$= -\left[5(10)^2 + \frac{5}{2}(20)^2 - 0\right]$

$500 - V = -1500$

$V = 500 + 1500$

$V_{(0,0)} = 2000$ volt

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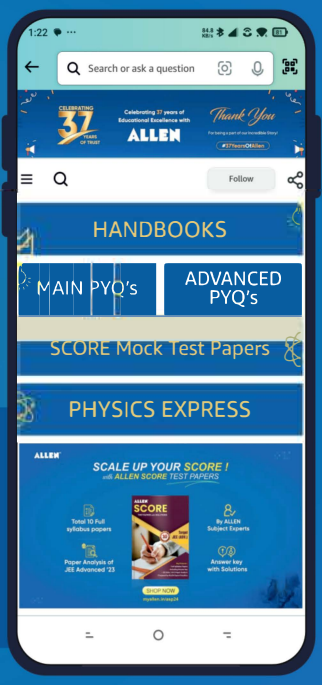

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