Scheme of evaluation

Mid-term exam - 2025

I PUC - PHYSICS

PART - A

I 1. b) Angle
2. c) $16 ms^{-2}$
3. c) acceleration
4. d) $\hat{n} = \frac{\vec{A}}{|\vec{A}|}$
5. c) r is along positive x-axis
6. d) four times
7. b) normal to each other
8. b) Forward direction
9. c) Conservation of Linear momentum
10. c) Static friction
11. d) Impulse
12. a) Newton
13. d) twice its initial value
14. b) Angular velocity
15. b) $\theta = 90^\circ$

II. 16. Zero
17. independent
18. dependent
19. increases
20. decreases

PART-B

III. 21) (i) SI unit of pressure is Nm^{-2} — 1M
(ii) SI unit of Torque is Nm — 1M

22) (i) Defⁿ of uniform acceleration —— 1M
(ii) Defⁿ of non-uniform acceleration —— 1M

23) statement —— 1M
explain with diagram & equation —— 1M

24) Inertia of rest & Inertia of motion —— 2M

25) $m = 2kg$
$\mu = 0.5$
$f = ?$

$f = \mu N$
$f = \mu mg$ —— 1M
$f = 0.5 \times 2 \times 9.8$
$f = 9.8N$ —— 1M

26) $P = \frac{W}{t} = \frac{\vec{F}.\vec{S}}{t}$ —— 1M

$P = \vec{F}\left(\frac{\vec{S}}{t}\right)$

$P = \vec{F}.\vec{V}$ —— 1M

27) a) Sum of upward forces = Sum of downward forces — 1M

b) Sum of anticlockwise moments = Sum of clockwise moments — 1M

28) Defⁿ- $\vec{L} = \vec{r} \times \vec{p}$

$L = rp\sin\theta$.

when $\theta = 90°$ — with definition —— 2M

PART-C (3)

IV. 29) three applications of dimensional analysis — (1M) each

30) Given $x = 18t + 5t^2$

When $t = 3s$, $\vec{x}_1 = 18(3) + 5(3)^2$

$\vec{x}_1 = 99m$ — (1M)

When $t = 5s$, $\vec{x}_2 = 18(5) + 5(5)^2$

$\vec{x}_2 = 215m$ — (1M)

average velocity, $\vec{V} = \frac{\Delta x}{\Delta t} = \frac{\vec{x}_2 - \vec{x}_1}{t_2 - t_1}$

$\vec{V} = \frac{215 - 99}{5 - 3} = \frac{116}{2}$

$\vec{V} = 58\ ms^{-1}$ — (1M)

31) Derivation of Range of projectile — (3M)

32)

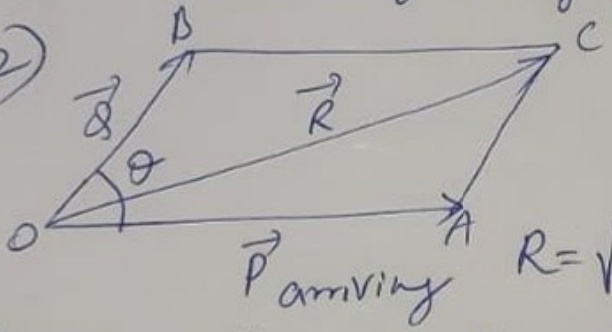


diagram — (1M)

$R = \sqrt{P^2 + Q^2 + 2PQ\cos\theta}$ — (2M)

33) Derivation of $F = ma$ — (3M)

34) Statement — (1M)

prove $W = (K.E)_{final} - (K.E)_{initial}$ — (2M)

35) any three differences — (3M)

36) When $\theta = 90^\circ$, $\vec{A} \times \vec{B} = AB$

when $\theta = 0^\circ$, $\vec{A} \times \vec{B} = 0$ — (1M)

Define based on angle — 2 dgs (2M)

PART-D

(4)

V. 37) V-t graph — 1M
Arrive slope, $a = \frac{v-u}{t}$ — 1M
Arriving $v^2 = u^2 + 2as$ — 3M — 5M

38) Deriving of Centripetal acceleration with diagram — 5M

39) Statement — 1M
$F_{AB} = -F_{BA}$ — 1M — 5M
Arriving $m_1v_1 + m_2v_2 = m_1u_1 + m_2u_2$ — 3M

40) With diagram, — 1M

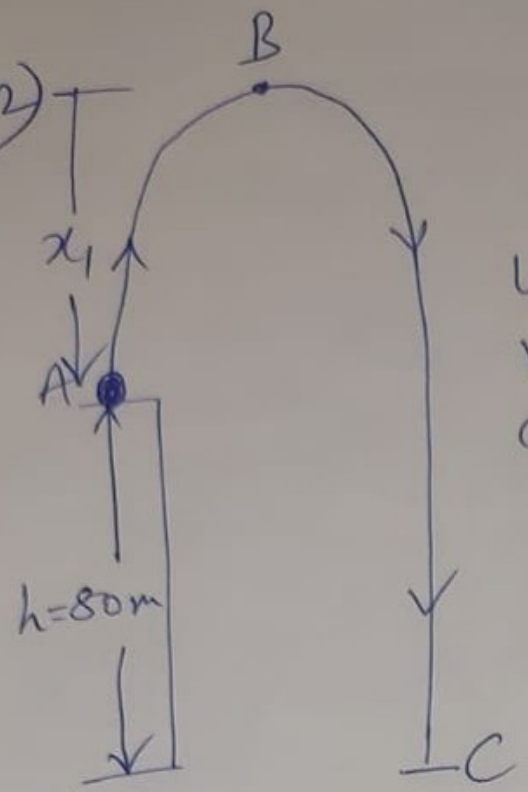
$E_A = mgh$ — 1M
$E_B = mgh$ — 1M — 5M
$E_C = mgh$ — 1M
Conclusion — 1M

41) (a) Defn of Centre of mass — 1M

(b) Expression $x_c = \frac{m_1x_1 + m_2x_2}{m_1 + m_2}$ — 1M
explg terms — 1M — 2M

(c) Defn of Radius of gyration — 1M
its SI units — metre — 1M — 2M

VI. 42)



From A to B

$u = 30 ms^{-1}$
$v = 0$
$a = -g$
$t = t_1$
$s = x_1$

We have
$v = u + at$
$0 = 30 - 9.8 t_1$
$9.8 t_1 = 30$
$t_1 = \frac{30}{9.8}$
$t_1 = 3.06\ s$ — 1M

$u = 30 ms^{-1}$
$s = x_1 = ?$
$t = t_1 = 3.06\ s$
$a = -g$

$s = ut_1 + \frac{1}{2} a t_1^2$
$x_1 = 30(3.06) - \frac{9.8}{2}(3.06)^2$
$= 91.8 - 45.88 =$
$x_1 = 45.92 m$ — 1M

From B to C

$s = x_1 + h = 45.92 + 80 m$
$s = 125.92 m$
$u = 0$
$v = ?$
$t = t_2$
$a = +g$

$s = ut + \frac{1}{2} a t^2$
$125.92 = 0 + \frac{g}{2} t_2^2$
$125.92 = \frac{9.8}{2} t_2^2$
$t_2^2 = \frac{125.92}{4.9} = 25.69$
$t_2 = 5.07\ s$ — 1M

The time taken by projectile to reach ground $= t = t_1 + t_2 = 3.06 + 5.07$
$t = 8.13\ s$ — 1M

$v = u + at$
$v = 0 + g t_2$
$v = 9.8(5.07)$
$v = 49.686 ms^{-1}$ — 1M

(6)

43) $m = 0.05kg$

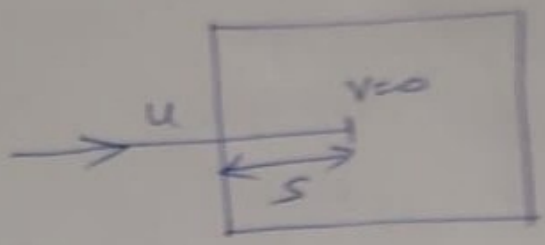
$u = 300ms^{-1}$

$V = 0$

$S = 0.1m$

$a = ?$

$F = ?$



$V^2 - u^2 = 2aS$ — (1M)

$0 - (300)^2 = 2a(0.1)$

$\boxed{a = -450000ms^{-2}}$ — (1M)

$F = ma$ — (1M)

$F = 0.05(-450000)$

$\boxed{F = -22,500N}$ — (2M)

44) $m = 200tons = 200 \times 1000kg = 200000kg$

$v = 108km/hr = 108 \times \frac{5}{18} = 30ms^{-1}$

Resistance, $R = 2kg\ wt\ per\ ton = 2 \times 9.8N\ per\ ton$

$= 19.6N\ per\ ton$ — (1M)

Resistive force, $F_{res} = 19.6N/ton \times 200ton = 3920N$ — (1M)

Since train is moving at uniform velocity,

the force exerted by the engine = the resistance force

$F_{engine} = F_{res} = \underline{3920N}$ — (1M)

Power, $P = F_{engine} \cdot V$ — (1M)

$P = 3920 \times 30 = 117600W$

$\boxed{P = 117.6\ kW}$ — (1M)

P.T.O →

45) $\omega_1 = 300 rpm$

$\omega_2 = 900 rpm$

$t = 10 s.$

$n = ?$

$\omega_1 = 300 \times \frac{2\pi}{60} = 10\pi \ rad\ s^{-1}$

$\omega_2 = 900 \times \frac{2\pi}{60} = 30\pi \ rad\ s^{-1}$ — (1M)

Angular acceleration, $\alpha = \frac{\omega_2 - \omega_1}{t}$ — (1M)

$\alpha = \frac{30\pi - 10\pi}{10}$

$= \frac{20\pi}{10\pi} = 2\pi$

$\boxed{\alpha = 2\pi \ rad\ s^{-2}}$ — (1M)

$\theta = \omega_1 t + \frac{1}{2}\alpha t^2$

$= (10\pi)10 + \frac{1}{2}(2\pi)(10)^2$

$\boxed{\theta = 200\pi \ rad}$ — (1M)

$\theta = 2\pi n$

no of revolutions $n = \frac{\theta}{2\pi} = \frac{200\pi}{2\pi}$

$\boxed{n = 100}$ — (1M)