FIRST YEAR HIGHER SECONDARY EXAMINATION MARCH 2020

PART III

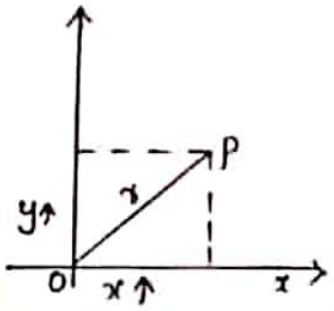
SUBJECT : PHYSICS

CODE : FY-24

TOTAL SCORE - 60

Qn No	Subqn	Answer Key	Score	Total
1		(C) Strong nuclear force		1
2		(a) -10 m, 15 m		1
3		(C) Inertia		1
4		(d) Torque		1
5		(b) Less than that of Steel		1
6	(a)	$ML T^{-2}$	1	
	(b)	$\left(\frac{\Delta m}{m} + 2\frac{\Delta V}{V} + \frac{\Delta T}{T}\right) \times 100\% = \frac{\Delta F}{F} \times 100\%$ OR Percentage error in centripetal force = (Error in m + (2 × Error in V) + Error in T) × 100%	1	2
7		Statement or proof OR If $F=0$, p is a constant		2
8	(a)	+ve or -ve (If lifted up directly without pulley work done by lifting force is +ve, work done against gravity is negative)	1/2	

8	(b)	−ve	½	2
	(c)	+ve	½	
	(d)	−ve	½	
9		$\tau = I\alpha$ OR $\tau = FR$ OR $I\alpha = FR$	1	2
		$I = \frac{MR^2}{2}$; $\alpha = 12.5\ rad\,s^{-2}$		
		Substitution and answer (unit not necessary)	1	
		[If only $I = \frac{MR^2}{2}$ is written] give ½ score		
10	(a)	Definition / Eqn	1	2
	(b)	Does not depend on mass of the object	1	
11		More Strength / reduce the weight / Reduce buckling / reduce bending of the pillar / low cost / large load bearing surface / reduce Stress		2
12		$\frac{F_1}{A_1} = \frac{F_2}{A_2}$	1	2
		$\frac{F}{\pi \times (0.05)^2} = \frac{1350 \times 9.8}{\pi \times 0.15^2}$	1	
		$F = 1470\ N$		
		OR		
		$F = 1500\ N$, If 'g' is taken as $10\ m/s^2$		

13		Explanation / figure / Eqn Surface tension	1 1	2
14		Sine or Cosine functions are Simple harmonic / $\sin\omega t - \cos\omega t = \sqrt{2}\sin\left(\omega t - \frac{\pi}{4}\right)$ / differentiating twice / Any related attempt		2
15		$V = \sqrt{\frac{T}{\mu}}$ $\mu = \frac{m}{\ell} = \frac{2.1}{12} = 0.175\ kgm^{-1}$ $343 = \sqrt{\frac{T}{0.175}}$; $T = 2.06\times10^{4}\ N$ OR Final answer only give 1 Score	1 1	2
16	(a)	Principle of homogeneity	1	
	(b)	$[V] = L^3$; $[D] = L^2$; $[U] = L\bar{T}^1$; $[t] = T$ Eqn is not correct OR Since dimension of LHS ≠ Dimension of RHS, Eqn is not correct give 2 Score	1 1	3
17	(a)		1	

17	(b)	$r = xi + yj$ or $x = r\cos\theta$ and $y = r\sin\theta$	1	3
	(c)	$R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$	1	
18	(a)	A → Total Energy B → potential Energy C → Kinetic Energy	1½	3
	(b)	Derivation (Graphical method can also be considered) OR Give 2 Score if either 'a' or 'b' is correct	1½	
19	(a)	Heat Engine	1	3
	(b)	4 processes or Diagram showing 4 steps [Isothermal Expansion, Adiabatic expansion, Isothermal Compression, Adiabatic Compression]	2	
20		$\beta = \frac{T_2}{T_1 - T_2}$ or $\beta = \frac{Q_2}{Q_1 - Q_2}$ $T_1 = 309\ K$, $T_2 = 282\ K$; $\beta = 10.44$ Substitution and answer OR $T_1 = (36 + 273) = 309\ K$; (½) Score $T_2 = (9 + 273) = 282\ K$; (½) Score	1 2	3

21		K.E $\propto T$ only is written give 1 Score Derivation of $K = \frac{3}{2} k_B T$		3
22	(a)	$-ve, -ve \,/\, 0.1\omega^2, 0.1 m\omega^2 \,/\, \omega^2 a, m\omega^2 a$	1	3
	(b)	$-ve$ OR $\frac{0.1\omega}{\omega^2 a}$	½	
	(c)	$-ve, -ve, -ve$ OR $V = \omega\sqrt{0.1^2 - 0.02^2}$; $a = 0.2\omega^2$ $F = -0.2 m\omega^2$ OR $V = \omega\sqrt{A^2 - x^2}$; $a = -\omega^2 x$, $F = m\omega^2 x$ OR If any 3 correct, give 3 Score	1½	
23	(a)	Travelling wave	½	3
	(b)	3 cm, 5·7 Hz OR $2\pi\sqrt{7} = 36t$ or $\omega t = 36t$ give ½ Score	1	
	(c)	$\frac{\lambda}{4}$	½	
	(d)	$kx = 0.018x$; $\frac{2\pi}{\lambda} = 0.018$ $\lambda = 3.5$ m	1	
		Any 3 part correct, give 3 Score		

24	(a)	$100\ ms^{-1}$ (Unit not necessary)	1	
	(b)	Area of ODB + Area of BCD = 1000 m OR Area under the graph gives the distance travelled	1½	4
	(c)	Slope = $-10\ m/s^2$ OR Slope of the graph or $\frac{dv}{dt}$ gives acceleration.	1½	
25	(a)	Derivation of $H_{max} = \frac{V^2 \sin^2\theta}{2g}$	3	4
	(b)	path 3 (For same velocity, if angle increases, height must increase; but it is not so in figure) OR Any related attempt give 4 Scores	1	
26		Statement / Eqn ($I_z = I_x + I_y$)	2	4
		Derivation with diagram and eqns as $I = \frac{mR^2}{4}$ OR Diagram or eqn $I = \frac{mR^2}{2}$ alone is written, give 1 score and if eqn $I = \frac{mR^2}{4}$ is written give 2 scores	2	

27	(a)	$\frac{C}{100} = \frac{F-32}{180}$; $T_c = 37$ If $T_c = 37$ only is written give 2 scores	2	4
	(b)	Definition / $Q = mL$	1	
	(c)	Thermal conductivity of brass is greater than wood OR Brass is a good conductor of heat OR Wood is a bad conductor of heat	1	
28	(a)	A → Normal reaction (½) B → weight or net force (½) C → Centripetal force (½) D → Frictional force (½) OR A → N B → mg C → $F = \frac{mv^2}{r}$ D → $F = \mu N$	2	5
	(b)	$N\cos\theta = mg + F\sin\theta$; $N\sin\theta + F\cos\theta = \frac{mv^2}{R}$	2	
	(c)	$F \leq \mu N$ OR $F \propto N$	1	

29	(a)	(i) Decreases (ii) Decreases (iii) Kinetic energy (iv) North – South Give 3 score for any three	3	5
	(b)	$T^2 \propto a^3$ or Statement	2	
30	(a)	Statement	1	5
	(b)	Derivation – $p + \frac{1}{2}\rho v^2 + \rho g h$ = Constant (1 score) $P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$ (1 score)	3	
	(c)	$F = 6\pi\eta rv$	1	

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