FWC

வடமாகாணக் கல்வித் திணைக்களத்தின் அனுசரணையுடன் தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்

Field Work Centre

தவணைப் பரீட்சை, மார்ச் - 2018

Term Examination, March - 2018

தரம் :- 12 (2019)	பௌதிகவியல்	புள்ளித்திட்டம்

PART - I

Q	A	Q	A	Q	A	Q	A	Q	A
1)	3	6)	4	11)	2	16)	1	21)	4
2)	2	7)	2	12)	1	17)	2	22)	3
3)	2	8)	5	13)	2	18)	5	23)	3
4)	1	9)	3	14)	2	19)	2	24)	1
5)	2	10)	4	15)	2	20)	3	25)	2

(4 × 25 = 100)

PART - II

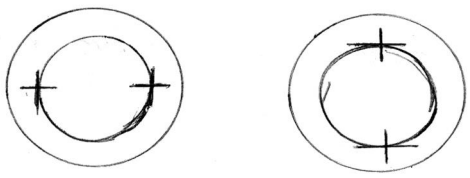
1) a) clean the tube by dilute NaoH, dilute HCl, Pure water ——— (1)

b) keep one end of the tube into the mercury then heat the middle Part of the tube. or/
Bent and connect a rubber tube with one end of the tube keep other end of the tube into the mercury Straighten the rubber tube. ——— (1)

c) i) $63.10 - 10.67 = 52.43$ mm ——— (1)

ii) $\frac{0.01}{52.43} \times 100 = 0.019\ \%$ ——— (1)

d) i)



——— (1) + (1)

ii) $d = \frac{(37.68 - 35.77) + (10.45 - 8.56)}{2} = 1.90$ mm ——— (1)

e) m_1 = Mass of clock class.

m_2 = Mass of clock class + Mass of mercury. ——— (1)

f) Density of Mercury $= \frac{m_2 - m_1}{\frac{\pi d^2}{4} \times L} = \frac{4(m_2 - m_1)}{\pi d^2 L}$ ——— (1)

g) Density $= \frac{4(17.240 - 15.220) \times 10^{-3}}{\frac{22}{7} \times (1.9)^2 \times 10^{-6} \times 52.43 \times 10^{-3}}$ ——— (1)

$= 13583 \text{ kg m}^{-3}$

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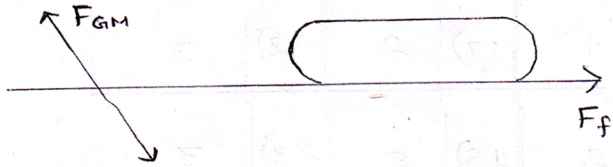
2> a)



——— (1)

b) Force exerted on tree trunk by the man. ——— (1)

c) $F_f = F\cos 60 = 600 \times \frac{1}{2} = 300 \text{ N}$ ——— (1)

d) i) $F_{GM}\sin\theta = 600 + 600\cos 60$ ---- (1)

$F_{GM}\cos\theta = 600\cos 30$ ---- (2)

$\frac{(1)}{(2)}$ $\tan\theta = \sqrt{3}$

$\theta = 60°$ ——— (1)

ii) $F_f = 600\cos 30 = 300\sqrt{3} \text{ N}$ ——— (1)

iii) $R + 600\cos 60 = 900$

$R = 600 \text{ N}$

$\mu = \frac{F_f}{R} = \frac{300\sqrt{3}}{600} = \frac{\sqrt{3}}{2} = 0.866.$ ——— (1)

iv) Work done $= 600\cos 30 \times 50$

$= 15000\sqrt{3} \text{ J}$ ——— (1)

v) From his body ——— (1)

vi) No, He should give to more energy to move his body. ——— (1)

e) No, $F_f = \frac{\sqrt{3}}{2} \times (1050 - F\cos 60)$ ---- (1)

$F_f = F\cos 30$ ---- (2)

(1)=(2), $\frac{\sqrt{3}}{2}(1050 - \frac{F}{2}) = F\frac{\sqrt{3}}{2}$

$1050 = \frac{3F}{2}$

$F = 700 \text{ N}$ ——— (1)

Limiting Frictional Force > Dynamic Frictional Force = 700 N

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3) i) A - Kerosen oil B - water ——— (1)

ii) P - Scale Q - Indicator ——— (2)
R - Rubber tube S - clip

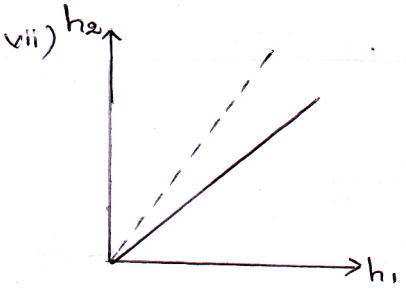
iii) Kerosen oil will mix with water ——— (1)

iv) Suck / remove air from the tube (using mouth)
using the clip close the tube ——— (1)

v) $\frac{0.1\,cm}{x} \times 100 = 1$

$x = 10\,cm$, water ——— (1)

vi) $h_2 = \frac{\rho_k}{\rho_w} h_1$ ——— (1)

vii) 

——— (1)

viii) $\rho_k / \rho_w = 0.85$
$\rho_k = 0.85 \times 1000 = 850\,kgm^{-3}$ ——— (1)

ix) correct draw ——— (1) 10

4) a) Energy transfer is maximum efficient ——— (1)

b) Place the bridges near place paper rider on the wire between bridges place vibrated tuning fork on top of the sonometer. surface, then moves the bridges until the paper rider jumps off ——— (1)

c) In Part (b) adjusting stage, place the paper rider on the middle, then vibrated turning fork on top of the sonometer. surface, Adjust the bridges until the Paper vider jumps off very quickly. ——— (1)

d)  ——— (1)

e) $f = \frac{1}{2l}\sqrt{\frac{Mg}{m}}$ ——— (1)

f) Maximum l, minimum percentage error ——— (1)

g) i) l^2 (m²), M (kg) ——— (1)

ii) (1, 0.04), (5, 0.2) ——— (1)

iii) $m' = \frac{0.2 - 0.04}{5 - 1} = 0.04\ m^2 kg^{-1}$ ——— (1)

iv) $m' = \frac{g}{4f^2 m}$

$f^2 = \frac{g}{4mm'} = \frac{10}{4 \times 1 \times 10^{-3} \times 0.04} = \frac{10^6}{4 \times 4}$ ——— (1)

$f = 250$ Hz

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5) a) i) $y = a \sin \omega t$

$\omega = 2\pi f$

$= 2\pi \times 0.70 = 4.4\ rads^{-1}$ ——— (1)

$a = \frac{0.36}{2} = 0.18$ m ——— (1)

$y = 0.18 \sin 4.4t$ or $y = 0.18 \cos 4.4t$ ——— (1)

ii) $g = \pm a\omega^2$

$10 = a \times 4.4^2$

$a = 0.52$ m ——— (1)

b) i) $I = \frac{1}{3} ml^2$

$I_1 = \frac{1}{3} \times 33 \times (0.90)^2 = 8.91\ kgm^2$ ——— (1)

$I_2 = \frac{1}{3} \times 33 \times (0.94)^2 = 9.72\ kgm^2$ ——— (1)

$I = I_1 + I_2 = 8.91 + 9.72 = 18.63\ kgm^2$ ——— (1)

ii) Some indication of uneven mass distribution. ——— (1)

iii) $I_1 \omega_1 = I_2 \omega_2$ ——— (1)

$10.25 \times 0.55 = 7.65 \times \omega_2$

$\omega_2 = 0.74\ rads^{-1}$ ——— (1)

c) i) change of kinetic energy $= \frac{1}{2} \times 7.65 \times (0.74)^2 - \frac{1}{2} \times 10.25 \times (0.55)^2$

$= 0.54$ J. ——— (1)

ii) work is being done by the diver. ——— (1)

d) i) → $s = ut$ ↑ $s = ut = \frac{1}{2} gt^2$

$2 = u_x \times 2$ $-4 = u_y \times 2 - \frac{1}{2} \times 10 \times 2^2$

$u_x = 1\ ms^{-1}$ (1) $u_y = 8\ ms^{-1}$ ——— (1)

ii) $v^2 = u^2 + 2gs$

$0 = 8^2 + 2 \times 10 \times h$

$h = 3.2$ m

Maximum height reached by G from water surface $= 3.2 + 4 = 7.2$ m ——— (1)

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6) a) i) 21 m – 23 m, counting squares. ——— (1) + (1)

ii) $E = \frac{1}{2}mv^2 = \frac{1}{2} \times 70 \times 10^2 = 3500J$ ——— (1)

iii) $mgh = \frac{1}{2}mv^2$

$h = \frac{v^2}{2g} = \frac{10 \times 10}{2 \times 10} = 5m$ ——— (1)

Total Kinetic energy converted as gravitational potential energy. (1)

iv) Need to get less far above the bar (center of gravity moves downward) ——— (1)

b) i) $\Delta p = m\Delta v = 70 \times 10 = 700 \, kgms^{-1}$ ——— (1)

ii) $F = \frac{\Delta p}{\Delta t} = \frac{700}{0.35} = 2000N$ ——— (1)

c) i) $\frac{1}{2}mv'^2 = mgh$

$v'^2 = 2gh = 2 \times 10 \times 4.5$ ——— (1)

$v' = \sqrt{90} = 3 \times 3.1 = 9.3 ms^{-1}$ ——— (1)

gradient $= g = \frac{v'}{t}$

$t = \frac{v'}{g} = \frac{9.3}{10} = 0.935$ ——— (1)

ii) Change of momentum $= 70 \times 9.3 - 70(-1)$ ——— (1)

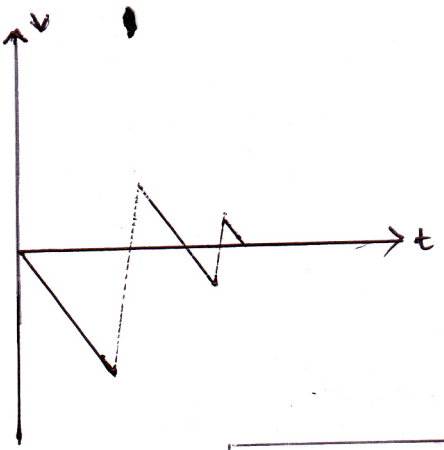
$= 70 \times 10.3$ ——— (1)

$= 721 \, kgms^{-1}$

Transfer momentum to matress $= 721 \, kgms^{-1}$

iii) Impact time. ——— (1)

iv)



——— (1)

Part I – 100

Part II – $70 \times \frac{10}{7} = 100$

Total = Part I + part II = 200

Final Marks = $\frac{\text{Total}}{2} = \frac{200}{2} = 100$

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7> a) i) Graph is straight line through origin and negative gradient. (1)

ii) gradient $= \frac{1}{0.028} \approx 36$ (1)

$f = \frac{w}{2\pi} = \frac{6}{2\pi} \approx 0.95\ Hz \approx 1\ Hz$ (1)

iii) Maximum speed $= aw = 0.028 \times 6 = 0.168\ ms^{-1}$ (1)

kinetic energy $= \frac{1}{2} mv^2 = \frac{1}{2} \times 0.2 \times (0.168)^2$

$= 0.1 \times 0.028$

$= 2.8\ mJ.$ (1)

iv) $\omega^2 = k/m$

$k = \text{gradient} \times m$

$= 36 \times 0.2$

$= 7.2\ Nm^{-1}$ (1)

b) i) Assume k_1 and k_2 are shiftness constant of springs then system has $k = k_1 + k_2$

$F = ma$ (1)

$-(k_1 x + k_2 x) = ma$

$-(k_1 + k_2) x = ma$

$a = -\frac{k}{m} x$ (1)

ii) $a = -\omega^2 x$

$\omega = \sqrt{k/m}$ (1)

$f = \frac{w}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$

c) i) $0.5 = \frac{1}{2\pi}\sqrt{\frac{2.8 \times 10^6}{m}}$ (1)

$\frac{1}{4} = \frac{1}{4\pi^2} \times \frac{2.8 \times 10^6}{m}$

$m = 2.8 \times 10^5\ kg.$ (1)

ii) $E = \frac{1}{2} kx^2 = \frac{1}{2} \times 2.8 \times 10^6 \times (0.7)^2$ (1)

$= 1.4 \times 10^6 \times 0.49$

$= 6.86\ kJ$ (1)

iii) After one oscillation, $E = 343\ kJ$

$343 \times 10^3 = \frac{1}{2} \times 2.8 \times 10^6 \times x^2$ (1)

$x^2 = \frac{343 \times 10^{-2}}{14}$

$x = 0.495\ m$

$\approx 0.5\ m$

iv) Protect the building from the vibration. (1)

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