



வடமாகாணக் கல்வித் திணைக்களத்தின் அனுசரணையுடன்  
தொன்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்

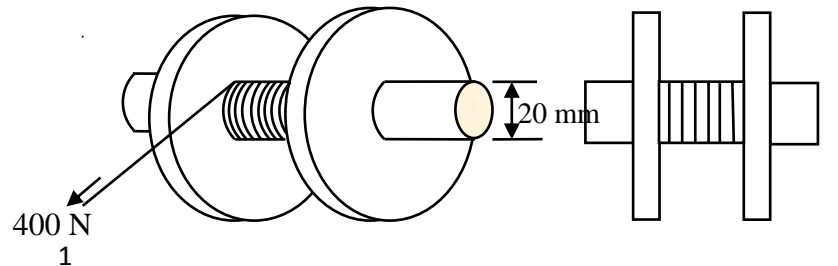
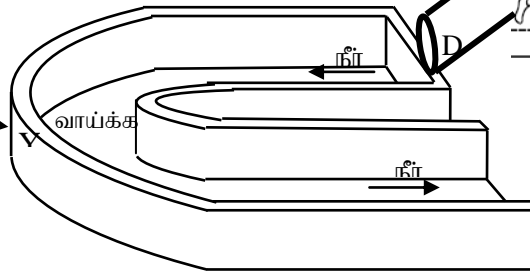
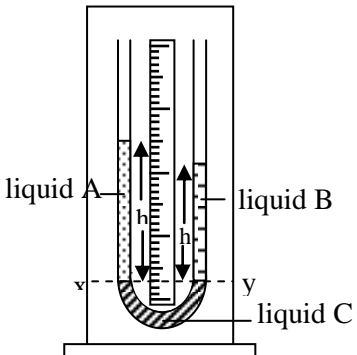
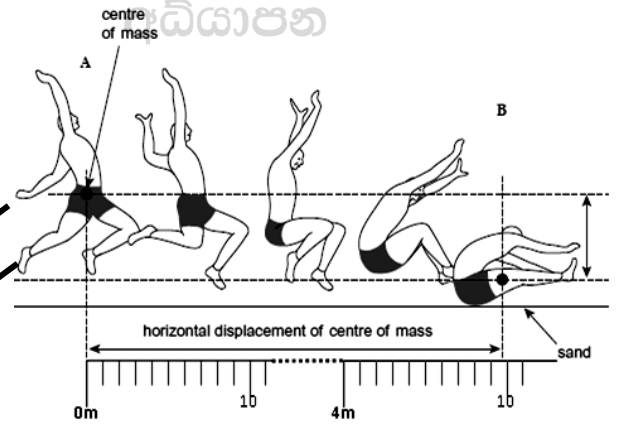
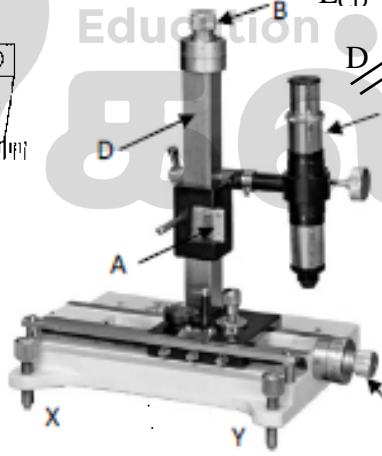
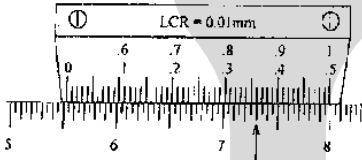
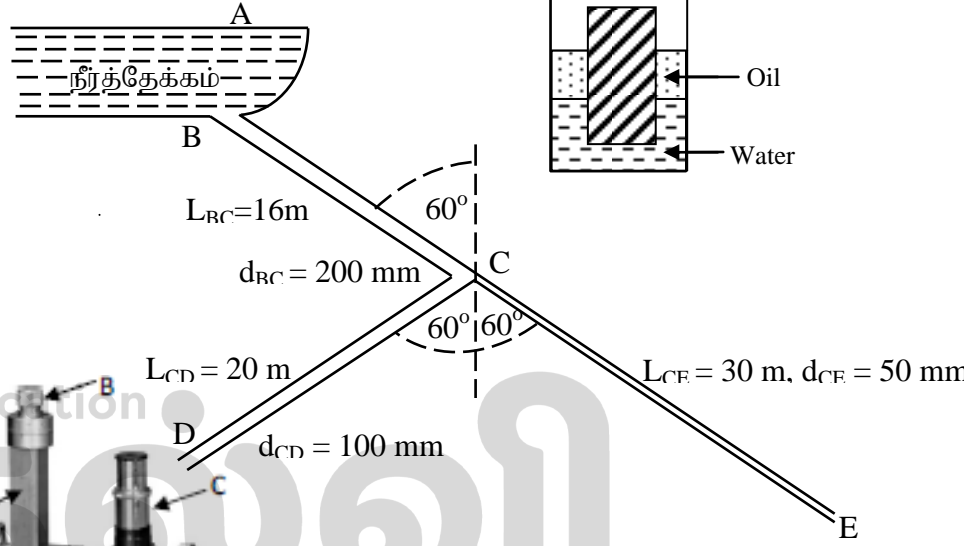
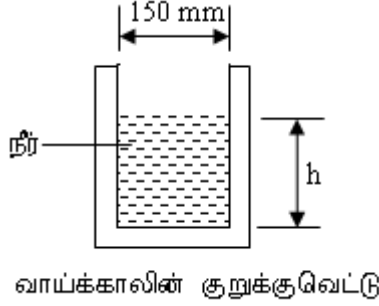
## Field Work Centre

தவணைப் பரீட்சை, மார்ச்- 2017

Term Examination, March - 2017

Physics Marking Scheme

Grade 12(2018)



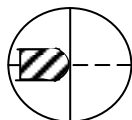
Physics  
Marking Scheme - March 2017  
Grade:- 12(2018)

**Part I (MCQ answer)**

01)	3	06)	5	11)	1	16)	4	21)	2
02)	3	07)	4	12)	2	17)	3	22)	2
03)	4	08)	2	13)	4	18)	1	23)	2
04)	2	09)	2	14)	2	19)	5	24)	3
05)	5	10)	4	15)	3	20)	1	25)	4

Part II

**Structured Essay**

1. (a) i) A - Vertical Vernier Scale  
B - minute adjustment screw  
C - microscope  
D - Vertical main scale (2)
- ii) Leveling the microscope with help of the spirit level and the leveling screws(X,Y) (1)
- iii) (a) Connect one end of the capillary tube with the rubber tube and other end dip into the mercury, press and release the rubber tube. (1)
- (b)  $L.C = (1 - 49/50) 0.5\text{mm} = 0.01\text{mm}$  (1)
- (c)  (1)
- (d) Reading =  $55\text{mm} + 36 \times 0.01\text{mm} = 55.36\text{mm} / 5.536\text{cm}$  (1)
- (e)  $m_1$  - mass of the watch glass  
 $m_2$  - mass of the watch glass and mercury } - (1)
- (f) (1) water (drops) stick with inner wall of the capillary tube  
(2) mass of the water thread is very small as fractional / percentage error is high for the mass measurement / difficult to mass measurement of the water thread. (1)
- (g) fractional error =  $\frac{2 \times 0.01}{40} = 0.005$  (1)

2. a.(i) The horizontal displacement of the centre of mass of the athlete from **A** to **B** = 4m 10 cm-----(1)

(ii) The estimate error = 0.5cm -----(1)

a. (i) for using  $s = ut + \frac{1}{2}at^2 \downarrow$

$$1.25 = \frac{1}{2} \times 10t^2$$

$$t = 0.5 \text{ s} \text{ ----- (1)}$$

$$(ii) v = \frac{4.1}{0.5}$$

$$v = 8.2\text{ms}^{-1} \text{ ----- (1)}$$

$$(iii) v^2 = u^2 + 2as \uparrow$$

$$v^2 = 2 \times 10 \times 1.25$$

$$v_v = 5\text{ms}^{-1} \text{ -----(1)}$$

$$v_H = 8.2 \text{ ms}^{-1} \text{ -----(1)}$$

b. (i)  $t = \frac{2s}{u+v}$

$$t = \frac{2 \times 0.41}{8.2}$$

$$t = 0.1 \text{ s} \text{ -----(1)}$$

$$(ii) a = \frac{v-u}{t}$$

$$a = \frac{0-8.2}{0.1}, \quad a = -82\text{ms}^{-2} \text{ ----- (1)}$$

$$\text{The resistive force} = 75 \times 82 = 6150 \text{ N} \text{ ----- (1)}$$

(iii) To avoid the rotational motion. -----(1)

10
----

3. (a)  $d_1 < d_2 < d_3$  (1)

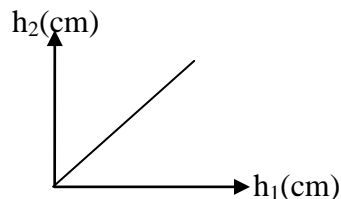
(b)  $h_1d_1 = h_2d_2$  (1)

(c) for equating the pressure due to the liquid columns A and B. (1)

(d) i) Add roughly equal amount of liquid A in the respective arm at a time, thereafter add the liquid B in the respective arm until the level of the liquid C become to same horizontal level in both arms, should measure different heights of liquid A ( $h_1$ ) and corresponding height of liquid B ( $h_2$ ). (2)

ii) less accuracy (1)

(e) i)



(1)

ii)  $m = d_1/d_2$

$$d_1 = 1000 \text{ kg m}^{-3} \quad m = 0.8$$

$$d_2 = 1000/0.8 = 1250 \text{ kg m}^{-3} \quad (1)$$

iii)  $1 \text{ mm/h} \times 100\% = 1\%$

(1)

$$h = 100 \text{ mm}$$

$$h = 10 \text{ cm}$$

(1)

10

4. (a) meter ruler, Rubber bung / Rubber hammer, (thermometer)

(1)

(b) Gently strike the tuning fork on the rubber bung / gently strike the rubber hammer on the tuning fork. (1)

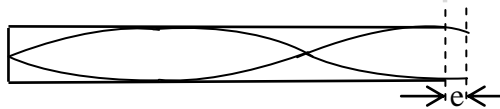
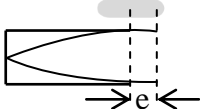
(c) Completely fill the tube with water, hold the vibrating tuning fork just above open end of the tube and slowly removing the water until first time maximum sound is heard. (2)

(d) i) Air in the tube / Air molecular in the tube

ii) tuning fork

(1)

(e)



(1)

$$(f) \frac{\lambda}{4} = 16 + e$$

$$\frac{3\lambda}{4} = 49 + e$$

$$48 + 3e = 49 + e$$

$$e = 0.5 \text{ cm} \quad (1)$$

$$\lambda = 4(16.5)$$

$$= 66 \text{ cm}$$

$$v = f\lambda = 500 \times \frac{66}{100}$$

$$v = 330 \text{ m s}^{-1} \quad (1)$$

(g) i. Speed of sound : decrease

Explanation : molecular mass of the alcohol > molecular mass of air

$$\text{But } v \propto \frac{1}{\sqrt{M}} \quad M \uparrow \quad \downarrow v \quad (1)$$

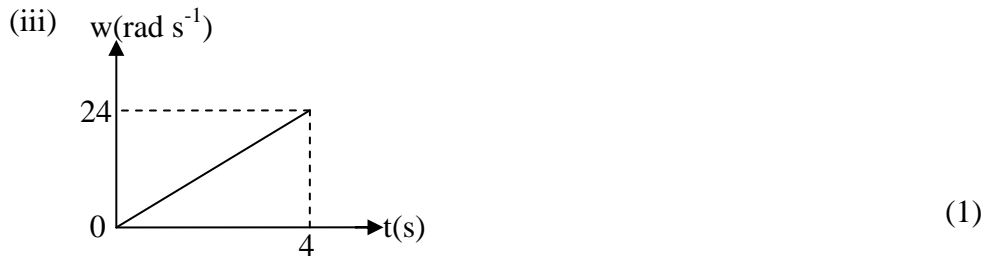
ii. end correction : remain constant

Explanation : end correction of the tube depends only for the diameter / radius of the tube (1)

**Part II**  
**Essay**

01)(a) (i)  $\theta_f = \omega_0 + \frac{1}{2}\alpha t^2$   
 $8 \times 2\pi = 0 \times t + \frac{1}{2} \times \alpha \times 4^2$   
 $\alpha = 6 \text{ rad s}^{-1}$  (1)

(ii)  $\omega_f = \omega_0 + \alpha t$   
 $\omega_f = 0 + 6 \times 4$   
 $= 24 \text{ rad s}^{-1}$  (max. angular velocity) (1)



(v)  $\text{Work} = F \times d$   
 $= 400 \times 2 \times \pi \times 20 \times 10^{-3} \times 8$   
 $= 384 \text{ J}$  (1)

(b) (i)  $\tau = I \times \alpha$   
 $I = \frac{\tau}{\alpha}$   
 $= \frac{400 \times 20 \times 10^{-3} - 2}{1 \text{ Kg m}^2 \text{ s}^{-2}}$  (1)

(ii) (A)  $\tau = I \alpha$   
 $-2 = 1 \times \alpha$   
 $\therefore \alpha = -2 \text{ rad s}^{-2}$   
 $\therefore \text{Angular retardation} = 2 \text{ rad s}^{-2}$  (1)

(B)  $\omega_f = \omega_0 + \alpha t$   
 $0 = 24 + (-2)t$   
 $\therefore t = 12 \text{ s}$   
 $\therefore \text{Duration of rotation} = 12 + 4$   
 $(\text{Time spent rest to rest}) = 16 \text{ s}$  (1)

(c) (i) Larger radius => greater torque => greater angular acceleration => takes shorter time (for the same angular displacement ) (1)

(ii) To smooth the engine revolution. (1)

(d) (i) Work = Sum of (Torque x angle turned)  
 $= 10 \times \pi/4 + 30 \times \pi/2 + \frac{1}{2} (30 + 10) \pi/4 + 10 \times \pi$   
 $= 2.5\pi + 15\pi + 5\pi + 10\pi$   
 $= 32.5\pi$   
 $= 97.5\text{J}$  (1)

(ii) Out put power of sewing machine = Work done per cycle x n of cycles per sec  
 $= 97.5\text{J} \times 2\text{s}^{-1}$   
 $= 195\text{W}$  (1)

(iii) Power supplied by the motor to the sewing machine =  $\frac{195\text{W}}{78\%} \times 100\%$   
 $= 250\text{W}$  (1)

(iv) Power drawn from the mains by the motor =  $\frac{250\text{W}}{40\%} \times 100\%$   
 $= 625\text{W}$  (1)

(v) Consumption of electrical energy = Power in kW x time in h  
 $= \frac{625\text{ kW}}{1000} \times 2000\text{h}$   
 $= 1250\text{kWh}$  (1)

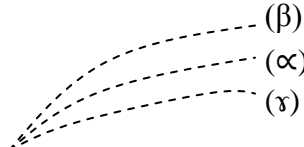
15

02) (a) (i) - Streamline flow  
 - nonviscous  
 - incompressible (1)

(ii)  $P + \frac{1}{2} \rho v^2 + \rho gh = \text{constant}$   
 identification of the symbols or terms (1)

(iii) ( $\alpha$ ) increase  
 ( $\beta$ ) decrease (1)

(iv) speed of airstream above the wing > speed of air stream below the wing  
 $\therefore$  air pressure above the wing < air pressure below the wing hence, there would be up thrust on the wings (1)

(v)  (1)

the paths for ( $\beta$ ) and ( $\gamma$ ) should be above and below the path for ( $\alpha$ ) respectively) (1)

(b) (i) ( $\alpha$ )  $A \rightarrow D$   

$$P_A + \frac{1}{2} P v_A^2 + 25pg = P_D + \frac{1}{2} P v_D^2 + 5pg \quad (1)$$

$$V_D^2 = 40g = 400 \quad (V_A = 0, P_A = P_D)$$

$$V_D = 20ms^{-1} \quad (1)$$

( $\beta$ )  $A \rightarrow E$   

$$P_A + \frac{1}{2} P v_A^2 + 25pg = P_E + \frac{1}{2} P v_E^2 + 0 \times pg$$

$$V_E^2 = 500$$

$$V_E = 10\sqrt{5}$$

$$= 22.4ms^{-1} \quad (1)$$

(ii) 
$$\pi \frac{(200 \times 10^{-3})^2}{4} V_{BC} = \pi \frac{(100 \times 10^{-3})^2}{4} \times 20 + \pi \frac{(50 \times 10^{-3})^2}{4} \times 22.4 \quad (1)$$

$$V_{BC} = 6.4ms^{-1} \quad (1)$$

(c) (i) Volume rate of delivery to canal  $= \pi \frac{(100 \times 10^{-3})^2}{4} \times 20$   
 $= 0.15ms^{-1} \quad (1)$

(ii)  $h \times 150 \times 10^{-3} \times 20 = 0.15$   
 $h = 0.05m \text{ or } 5.0cm \quad (1)$

(iii) mass rate of flow  $= 0.15 \times 1000$   
 $= 150kgs^{-1} \quad (1)$

(iv) Thrust  $= \text{mass rate of flow} \times \text{change in velocity}$   
 $= 150 \times [20 - (-20)]$   
 $= 6000N \quad (1)$

15

- 03) (a) The sudden breaking of rock within the earth or an explosion (1)  
 (b) The energy releasing point of the earthquake (1)  
 (c) The point on the earth's surface directly above the focus is earthquake's epicenter (1)  
 (d) P - waves S - waves  
 1. longitudinal waves transverse waves  
 2. high speed low speed  
 3. travel through solid or fluid only solid / do not exist in a fluid  
**only two correct provide (1)**  
**all three are correct provide (2)**  
 (e) The distance of the epicentre from recording station is d. (say)  

$$\frac{d}{3kms^{-1}} - \frac{d}{5kms^{-1}} = 50s \quad (1)$$

$$d \frac{[5-3]}{15} = 50$$

$$d = 375km \quad (1)$$
  
 (f) Richter scale (1)

- (g) i. Under water earthquakes }  
 ii. transverse waves } (1)

(h) i.  $720\text{kmh}^{-1} = \frac{720 \times 1000}{3600} \text{ms}^{-1}$   
 $= 200\text{ms}^{-1}$

$$V = \sqrt{gh}$$

$$200 = \sqrt{10 \times h}$$

$$10h = 200 \times 200$$

$$h = 4000\text{m}$$

$$= 4\text{km}$$

(1)

ii.  $T = \frac{\lambda}{v}$   
 $= \frac{6 \times 10^3}{200}$   
 $= 30\text{sec}$

(1)

iii.  $\omega = 2\pi f = \frac{2\pi}{T} = \frac{2 \times 3}{30} = 0.2 \text{rads}^{-1}$

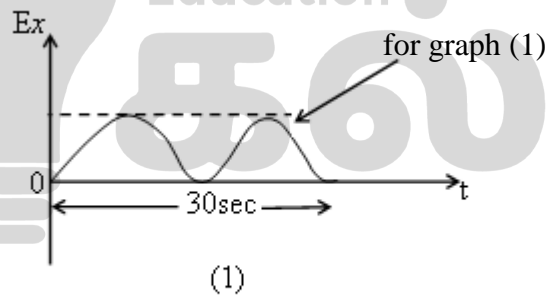
(1)

$$V = A\omega$$

$$A = \frac{V}{\omega} = \frac{0.4}{0.2} = 2\text{m}$$

(1)

iv.



15

Part I =  $25 \times 2 = 50$

Part II Structure  $4 \times 10 = 40$

Essay  $2 \times 15 = 30$

Final Marks =  $Part(I)marks + \frac{Part(II)marks}{7} \times 5$