M.C.Q answers

1) 4   2) 3   3) 1   4) 3   5) 4   6) 5   7) 1   8) 5

9) 2   10) 3   11) 2   12) 5   13) 5   14) 4   15)2   16) 3

17) 1   18) 4   19) 2   20) 1   21) 4   22) 5   23) 1   24)1

25) 2   25 X 2= 50

Structured Essay

1)
   i. 0.01mm 01
   ii. 0.05mm 01
   iii.
      a) 1.45mm 01
      b) 1.50mm 01
   iv.
      a) Meter ruler 01
      b) Place the spherometer on a sheet of paper and press to imprint -........01
         Measure the distance between adjacent marks produced by the spherometer legs 01
   v. $R = \dfrac{a^2}{6h} + \dfrac{h}{2} = \dfrac{(3X10^{-2})^2}{6X1.5X10^{-3}} + \dfrac{1.5X10^{-3}}{2} = 100.75X10^{-3}m$ 01
   vi. Thickness of a small disc 01
   vii. Divide the circular scale into more divisions 01

                                                    { Total-10}

2)

(a) $w_o = Ah_1d_1g$ ....both(1)
    $w_w = Ah_2d_2g$ ....

(b)(i) $w_o = w_w$ ....(1)

   (ii)   ....(1)
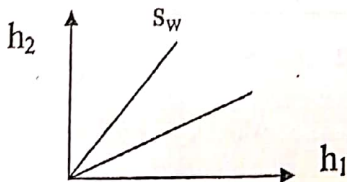
(iii) multiplying the gradient by d_w ....(1)

(iv) 870 kgm^{-3} ....(1)

(v) ....01 ....(1)

(c) fractional error in measuring h₁ increases ....

d) (i)   travelling microscope ....(1)

(ii)   focus the horizontal cross wire of the travelling microscope to the ring point P/Q then focus the horizontal cross wire of the travelling microscope to the oil and water menisci/ surfaces/ levels. ....both (1)

(e)   no, turning moment of the weights canceled. ....both(1)

<div align="center">No marks to forces/ masses equal   { Total-10}</div>

3)

a)   A-Rotational motion
       B-Translational motion 01

b)

   i. $a = R\alpha$ 01
   ii. $\tau = I\alpha$ 01

c)   A-Will rotate with constant angular velocity
       B- Will move with acceleration 01

d)

   i.   Conservation of angular momentum 01
   ii.   When no external torques act 01
   iii. $I_1 = \frac{1}{2}MR^2$, $I_2 = \frac{1}{2}(\frac{M}{2})R^2$

       $I = I_1 + I_2$ 01

       $I_1\omega_0 = I\omega$ $\frac{1}{2}MR^2\omega_0 = \frac{3}{4}MR^2 \omega$

       $\omega = \frac{2}{3}\omega_0$ 01

e)

   i.   A will perform both rotational and translational 01
   ii.   No Because the energy lost by the weight B is now used to produce both rotational and translational motions 01

<div align="right">{ Total-10}</div>

4)
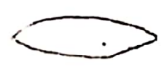
   i.   01

   ii. $f = \frac{1}{2\ell}\sqrt{\frac{Mg}{m}}$ 01

   iii.   First use the tuning fork with the lowest frequency because to make sure that the wire is long enough to get the resonance length for all frequencies 01
        Start taking data with the tuning fork with highest frequency because to make sure that the fundamental mode of resonance is taken in increasing the resonance length for successively decreasing frequencies 01

   iv.   First bring the two pegs close together and sounded tuning fork pressed on the sonometer then increase the distance between them until paper piece thrown for the first time
       01

   v. $f = \frac{1}{2\ell}\sqrt{\frac{Mg}{m}}$, $\ell = [\frac{1}{2}\sqrt{\frac{Mg}{m}}] \frac{1}{f}$ 02

   vi. $\frac{1}{2}\sqrt{\frac{Mg}{m}} = 10ms^{-1}$, $m = \frac{20}{400} = \frac{1}{20}$ 01

   vii.   Vibration of amplitude is large 01

   viii.   1mm 01

<div align="right">{ Total-10}</div>

Essay

1)

1)
a)
i.

applied force

lift

Drag force

weight

....02
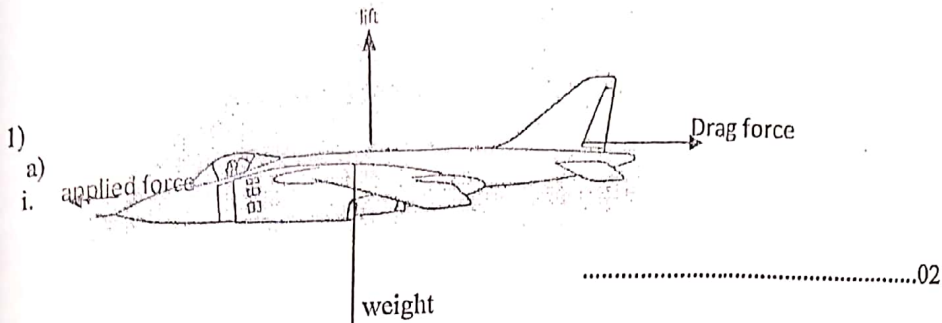
ii. Explain using Bernoulli's ..?..............................02

b)
i. $180\,km\,h^{-1} = \frac{180 \times 1000\,m}{3600\,s} = 50\,m\,s^{-1}$ 01

$$S = \frac{(V+U)}{2}t$$

$750 = \left(\frac{50+0}{2}\right)t \qquad t = 30s$ 02

ii. $V^2 = U^2 + 2as$, $50^2 = 0^2 + 2a \times 750$, $a = \frac{5}{3}\,m\,s^{-2}$ 02

, $F = ma$, $F = \frac{11000 \times 5}{3}\,N = \frac{55000}{3}\,N$ 02

iii. $P = \frac{W}{t} = \frac{\frac{1}{2} \times 11000 \times 50^2 - \frac{1}{2} \times 11000 \times 0^2}{30}$ $W = 458333.333W$ 02

iv. air resistance and frictional force may act.........01

c) Drag force is less ....01 　　　　　**{ Total-15}**

2)

a) In the instance of sudden deceleration of the vehicle the force for the deceleration of passenger will be provided by the seat belt, unless passenger will hit the wind screen(according Newton's first law) 02

b) Passenger seated in rear part will be thrown towards the wind screen and driver 02

c)

1.Jhon; $F = ma$

, $F = 80 \times 300\,N = 24000\,N$ 02

, Helen; $F = ma$
$F = 60 \times 100 = 6000N$ 02

2. Jhon; $I = F \times t$

$I = 24000 \times 0.1 = 2400Ns$ 02

Helen; $I = F \times t$

$I = 6000 \times 0.1 = 600Ns$ 01

3. the area of acceleration vs. time graphs represents change in velocity, final velocity zero and s...
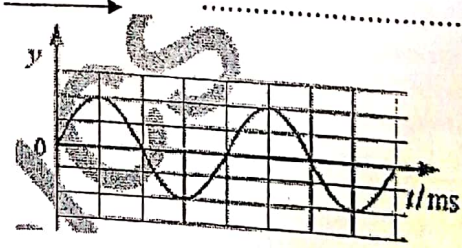10m/s therefore their speed = 10m/s
.... 02

4.

John

v

Helen

.............................02
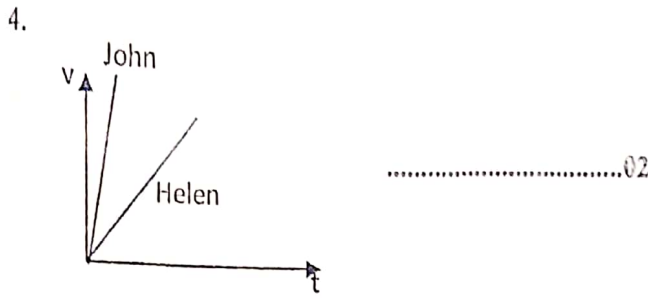
{ Total-15}

3)

a) Light, string, water waves (T)
   Sound (L) ....(1)
b) 1. 1.75 m ....(1)
   2. 1000/7 = 142.85 s ....(1)
   3. V= 142.5 X 1.75 ....(1)
        = 249.375 ms⁻¹ ....(1)
c) (1) 2.5m ....(1)
   2)   i) V_c= (10X 2.5)$^{1/2}$ = 5ms⁻¹ ....(1)

        ii)V_t = (10X 1.5)$^{1/2}$ = 3.87 ms⁻¹ ....(1)

   3)   With the crest travelling faster than the trough,
        the suggested shape of wave after Q is:

        (ans)
        © Step-by-Step

        ....(2)

d) (1) figure P progressive and Q standing ....(1)
   2) $\lambda/2 = 8 \times 0.05$
             = 0.8 m ....(1)
   3)   ....(1)
             ....(1)
   4)

Each square represent 10 cm (only shape)......................(1)   { Total-15}

Final marks = $[50 + \dfrac{50}{(40+30)}]$ %