G.C.E A/L Examination November - 2018

Fied Work Centre

FWC

Grade - 12 (2020) **PHYSICS** **Marking Scheme**

PART - I

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

25 x 2 = 50 MARKS

PART II A STRUCTURE

1) (a) (i) A – Main Scale
B – Circular Scale
C – Screw
D – Tripod

All four (4) correct award (02) MARKS
Two or Three correct award (01) MARK

ii) 0.01 mm — (01) MARK

(b) (i) Obtain the impression of the tripod by pressing it on a white sheet of paper and measure the distance between the marks. (01) MARK

(ii) Place the spherometer on a plain sheet of glass and adjust the screw just to touch its own image, and then take the reading. (01) MARK

Raise the screw and then place the spherometer on the watch glass. Adjust the screw until it touches its own image and take the reading. The distance moved by the screw can be obtained from the above two readings. (01) MARK

(iii) Position – I reading = 0.32 mm
Position – II reading = 1.18 mm
} If both are correct (01) MARK

(iv) $h = 1.3$ mm ——— (01) MARK

(v) $R = \frac{a^2 + h^2}{2h}$ For substitution ——— (01) MARK

$= \frac{4 + 0.13^2}{2 \times 0.13} = \frac{4.169}{2.6} \simeq 15$ cm Answer ——— (01) MARK

TOTAL 10 MARKS

02) (a) (i) To find whether the pulleys are smooth, (01) MARK

(ii) The meeting point X of the three strings must come back to the same position. (01) MARK

(b) (i) For marking X (01) MARK

(ii) For marking F_1, F_2 and F_3 (01) MARK

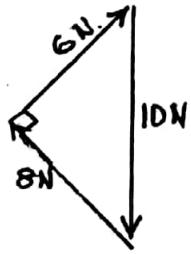
(iii) $\underline{F_1} + \underline{F_2} = (-)\underline{F_3}$ (01) MARK

(c) Set square or plane mirror, divider, metre scale and quadruple beam balance. — If all correct (01) MARK

(d) The values of weights P, Q and R.
Marking the positions of the strings on the white sheet of paper using either set square or plane mirror. — (01) MARK

(e) $F_1 = 8$ N $F_2 = 10$ N $F_3 = 6$ N ——— (01) MARK

(f)



——— (01) MARK

(g) The pulleys are not smooth. ——— (01) MARK

TOTAL 10 MARKS

03) (a) (i) 1 mm ——— (01) MARK

(ii) $10 \times 10^{-3} \times 10 \times 10 \times 10^{-2} = F \times 5 \times 10^{-2}$ — (01) MARK

$F = \frac{1}{5} = 0.2$ N — (01) MARK

(b) (i) At 10 cm mark. ——— (01) MARK

(ii) $mg \times 10 \times 10^{-2} = F \times 5 \times 10^{-2}$

But $F = 0.4\ N$ —— (01) MARK

$mg \times 10 \times 10^{-2} = 0.4 \times 5 \times 10^{-2}$

$m = \frac{2}{100}\ kg$

$= 20\ g$ —— (01) MARK

(c) The diameter of the rubber cord —— (01) MARK

Travelling microscope —— (01) MARK

(d) The reading should be taken by placing the metre scale by the side of rubber cord. —— (01) MARK

The points A and E should be measured —— (01) MARK

TOTAL 10 MARKS

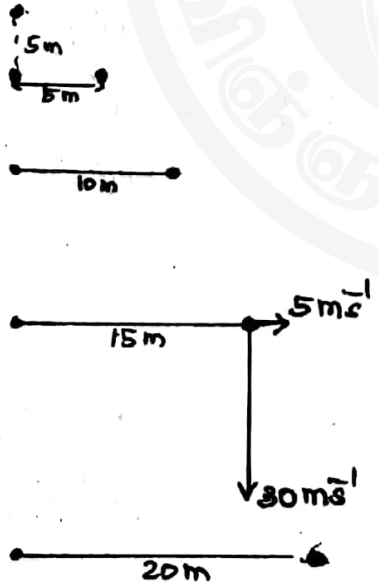
04) (i) Newton's second Law of motion.

$F = ma$

$mg = ma$

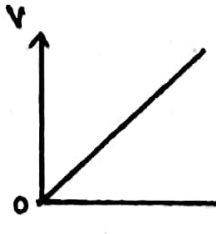
$\therefore a = g$. Moves downwards from rest with uniform acceleration g. —— (01) MARK

(ii)



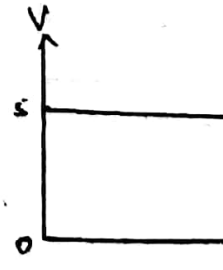
If the scale is correct award (02) MARKS

(iii)



(01) MARK

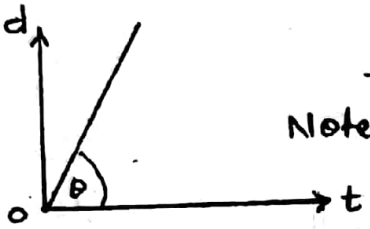
(IV)



(01) MARK

(v) 2N ↓ — (01) MARK

(vi) 5ms⁻¹ →
30ms⁻¹ ↓ — (01) MARK — (01) MARK

(vii) 

Note: θ should be big — (02) MARK

TOTAL 10 MARKS

PART-II B
ESSAY

01) (a) Product of mass of an object and its velocity /
Product of mass of a system and the velocity of its centre of mass (01) MARK

(b) $mv \times t = m \times s$

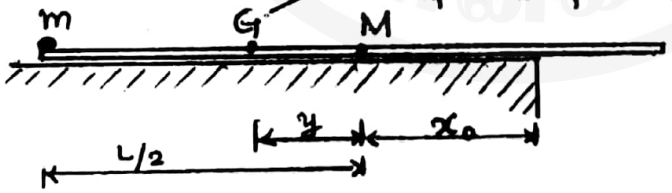
$[L.H.S] = [mvt] = MLT^{-1}.T = ML$

$[R.H.S] = [ms] = ML$

$\therefore [LHS.] = [R.H.S]$ — (01) MARK

(c)(i) Beyond the right side edge of the table — (02) MARKS

(ii) centre of mass of the system at the beginning.



$M.y = m(\frac{L}{2} - y)$ — (01) MARK

$y = \frac{m}{(M+m)} \cdot \frac{L}{2}$ — (01) MARK

The distance travelled the centre of mass of the system

$= x_0 + y$ — (01) MARK

$= x_0 + \frac{m}{M+m} \cdot \frac{L}{2} = \frac{Mx_0 + m(\frac{L}{2} + x_0)}{M+m}$ — (01) MARK

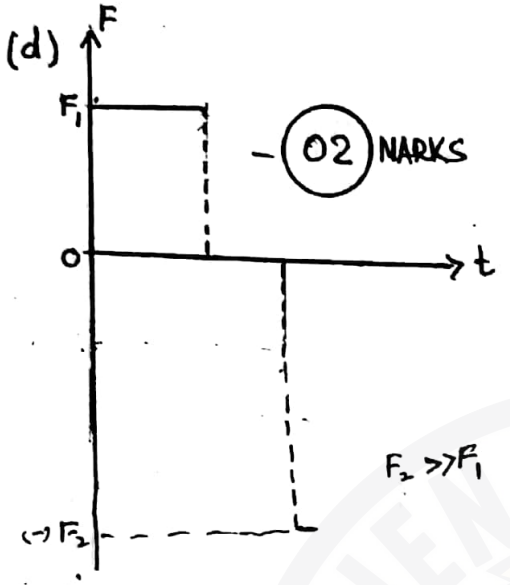
iii) The momentum of the system is constant — (01) MARK

mu = constant

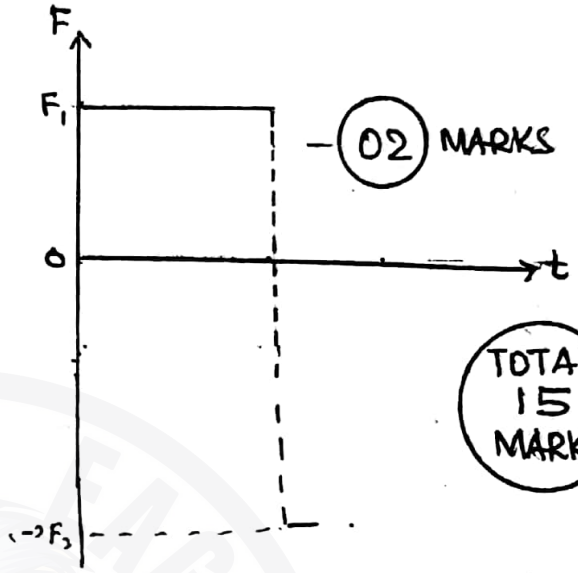
$$mu \times t = (M+m)\left[\frac{Mx_0 + m\left(\frac{L}{2} + x_0\right)}{M+m}\right]$$ ——— (01) MARK

$$\therefore t = \frac{Mx_0 + m\left(\frac{L}{2} + x_0\right)}{mu}$$ ——— (01) MARK

(d)



— (02) MARKS



— (02) MARKS

TOTAL 15 MARKS

02 (a) (i) 300 m ——— (01) MARK

(ii) $W = 1200 \times 300 = 3.6 \times 10^5$ J ——— (01) MARK

(iii) $P = F.V = 1200 \times 15 = 1.8 \times 10^4$ W ——— (01) MARK

(b) (i) $K.E = \frac{1}{2}mv^2 = \frac{1}{2} \times 800 \times 15^2 = 225 \times 400 = 9 \times 10^4$ J ——— (01) MARK

(ii) (1) A driving force is needed to balance the opposing force acting on the car. ——— (02) MARKS

(2) Used for doing work against the opposing force

OR

Work done by the driving force = work done by the opposing force :- (02) MARKS

(c) (i) $-a = \frac{15-0}{4} = \frac{15}{4} = 3.75\ ms^{-2}$ ——— (01) MARK

(ii) $F = ma$

$= 800 \times \frac{15}{4} = 3000$ N ——— (01) MARK

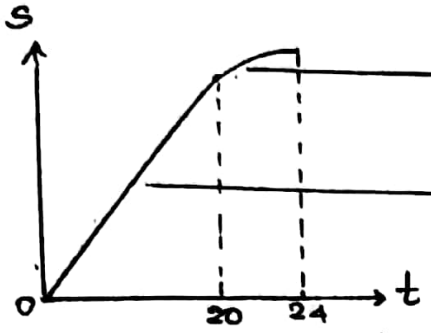
(iii) Power = F.V

Braking force F is constant

The speed of vehicle V is reducing.

Hence, the power wasted gradually reduces ——— (02) MARKS

(d) (i)



01 MARK

01 MARK

(ii) $V_{av} = \frac{300}{24} = 12.5\ ms^{-1}$ — 01 MARK

TOTAL 15 MARKS

(03) (a) Rate of change of momentum $= \frac{mv-0}{t} = \frac{mv}{t}$ — 01 MARK

(b)(i) Mass rate $= AV\rho = (0.025 \times 2) \times 2 \times 1050 = 105\ kgs^{-1}$ — 02 MARKS

(ii) Rate of change of momentum $= (AV\rho)V$

$= 210\ N$ — 02 MARKS

(iii) $F = 210\ N$ — 01 MARK

(iv) Newtons 2nd Law — 01 MARK

Newtons 3rd Law — 01 MARK

(v) Motion of rocket / Jet planes — 01 MARK

(vi) $F = ma$

$210 - 45 = (450 + 2 \times 50)\, a$

$a = \frac{165}{550} = 0.3\ ms^{-2}$ — 01 MARK

(c) (i) Work done against opposition = opposition x distance

$= 100 \times 100 = 10^4\ J$ — 01 MARK

(ii) The speed attained by the boat in 1 minute be $= V_0$

$V_0 = 0 + 0.3 \times 60 = 18\ ms^{-1}$ — 01 MARK

K.E = K.E when entering the new region — work done against opposition

$= \frac{1}{2} \times 550 \times 18^2 - 10^4$ — 01 MARK

$= 79100\ J$ — 01 MARK

(iii) $V^2 = u^2 + 2as$

$0 = 18^2 + 2 \times 0.3 \times s$

$s = \frac{324}{0.6}$

$s = 540m$ — 01 MARK

TOTAL 15 MARKS