Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Mechanics And Materials

Merit Minds
www.merit-minds.com
Exam Preparation and Free Resources

Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

(a) arrow between block and belt pointing upwards along the belt

1

(b) (F =) 19$g$sin23° to give 72.8 (N) ✔

Allow 2 sf answer.

1

(c) uses $F = \frac{\Delta(mv)}{\Delta t}$

*Allow for MP1 use of appropriate kinematic equation for a **AND** use of $F = ma$*

F = 12 (N) ✔

their (b) + 12 (N) ✔

Expect 82 or 85 (N)

3

(d) uses V and I to get total input power or energy ✔

P_{input} *of motor = 110 × 5.0 = 550 W*

E_{input} *= 550 ×* $\frac{8.0}{0.32}$ *= 13 750 J*

uses efficiency equation ✔

P_{useful} *to belt = 550 × 0.28 = 150 W*

E_{useful} *= 3850 J, from 154 ×* $\frac{8.0}{0.32}$ *, or 13 750 × 0.28*

determines power or energy to move one block ✔

P_{block} *= 22 or 23 W*

E_{block} *= 560 or 580 J*

divides (total) useful power or energy by individual power or energy to give answer of 6 blocks ✔

Allow ecf for MP4 only for their (c)

4

[9]

Q2.

(a) Centripetal force acts inwards / towards the centre of rotation ✔

Downloaded from www.merit-minds.com

Links reaction force to centripetal force ✔

2

(b) Equates forces AND states **either** centripetal force with correct symbols✔

$F = m_A r\omega^2$

$F = m_B (L - r)\omega^2$

In MP1 condone: equations containing v; use of ω_A and ω_B for the angular velocities.

cancelling ω✔

$m_A r\omega^2 = m_B(L - r)\omega^2$

$r = \frac{m_B L}{m_A + m_B}$

E.g.

In MP2 it must be clear that the angular velocity and not the velocity.

2

(c) The angular speed is the same for A & B or

Rotational radius for B less than that for A ✔

Both of these points AND $v = r\omega$ so velocity of A is greater.✔

Alternative for MP2:

Both of points in MP1 AND

A travels greater distance in the same time.

2

(d) Use of safety factor e.g. maximum stress << 0.300 GPa ✔

$F = ma = 1.32 \times 10^6 \times 3.7$✔ (= 4.9×10^6 N)

$A = \frac{F}{\sigma}$ valid substitution ✔

$\sqrt{\frac{4A}{\pi}}$ ✔ (expect > 0.144 m)

Valid justification for selection of maximum stress used e.g. using a stress that is from the linear / elastic section of the graph or reference to either safety factor or trying to limit weight of cable. ✔

Alternative for MP1: they can work through for a stress of 0.3 GPa and then increase the diameter, if justified as a safety factor. Do not allow use of stress ≈0.3 GPa for full marks.

Allow ecf for stress and force

5

[11]

Downloaded from www.merit-minds.com