Name of the Student:_____
Max. Marks : 16 Marks **Time : 16 Minutes**

Mark Schemes

Q1.

(a) 1.3×10^5 Pa **(1)**

1

(b) (i) work done = area enclosed by loop **(1)**
suitable method used to find area (e.g. counting squares) **(1)**
correct scaling factor used **(1)**
(work done) = 0.11 J **(1)** (accept 0.08 to 0.14 J)

(ii) 360 rev $min^{-1}\left(= \frac{360}{30}\right)$ = 6 cycles sec^{-1} **(1)**

power (= 2 cylinders × 0.11 J per cylinder × 6 cycles sec^{-1})
= 2 × 6 × 0.11 = 1.3 W **(1)** (0.96 to 1.56 W)

6

(c) friction between sliding surfaces
air resistance in tubing
heat generated by fast compression lost to surroundings (any one) **(1)**

1

[8]

Q2.

(a) (i) $\alpha\left(= \frac{\omega_2 - \omega_1}{t}\right) = \frac{1100 - 0}{4.2}$ = 260 rad s^{-2} **(1)** (262 rad s^{-2})

(ii) T (= $I\alpha$) = $7.6 \times 10^{-4} \times 262$ = 0.20 N m **(1)**

2

(b) $I_{liquid} = 8 \times (3.0 \times 10^{-3} (84 \times 10^{-3})^2 = 1.7 \times 10^{-4}$ (kg m^2) **(1)**

$I_{total} = 7.6 \times 10^{-4} + 1.7 \times 10^{-4} = 9.3 \times 10^{-4}$ (kg m^2) **(1)**

$\alpha\left(= \frac{T}{I}\right) = \frac{0.20}{9.3 \times 10^{-4}}$ = 215 (rad s^2) **(1)**

$t\left(= \frac{\omega_2 - \omega_1}{\alpha}\right) = \frac{1100}{215}$ **(1)** **(**= 5.1 s)

(allow C.E for value of I_{liquid})

3

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(c) $\theta_1 \left(= \frac{(\omega_1 + \omega_2)}{2} t \right) = \frac{1100}{2} \times 5.0 = 2750$ (rad)

$\theta_3 = \frac{1100}{2} \times 6.0 = 3300$ (rad) **(1)** **(**for both θ_1 and θ_3)

θ_2 (= $\omega_2 t$) = 1100 × (60 – 11) = 53900 (rad) **(1)**
total angle turned = $\theta_1 + \theta_2 + \theta_3 = 60 \times 10^3$ rad **(1)**

3

[8]

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