

ANSWER QUESTION 4 ONLY

(b) (i) No slipping so $\alpha r_{\text{pulley}} = a$
 $\alpha \cdot 0.15 = a$

(c) We have $a = g - T/1.5$ — ①

$\alpha = T/0.15$ — ②

$a = \alpha \cdot 0.15$ — ③

(i) Divide Eq ① by Eq ② : $\frac{g - T/1.5}{T/0.15} = \frac{a}{\alpha}$

use Eq ③ $= a / (a/0.15)$
 $= 0.15$

$\Rightarrow 9.8 - T/1.5 = T$

$T(1 + 1/1.5) = 9.8$

$T(5/3) = 9.8$

T = 5.9 N

(ii) $a = 9.8 - (5.9/1.5) = \underline{\underline{5.9 \text{ m/s}^2}}$

(iii) $\alpha = a/0.15 = 5.9/0.15 = 39 \text{ rad/s}^2$

(d) $\tau_{\text{net}} = I \alpha$
 $= \left(\frac{1}{2} \times 2 \times 0.15^2 \right) \cdot 39$
 $= \underline{\underline{0.88 \text{ Nm}}}$

or $\tau = T r_{\text{pulley}}$
 $= 5.9 \times 1.5$
 $= \underline{\underline{0.88 \text{ Nm}}}$