

Question 1 - 19

$$1500 \text{ RPM} = N$$

$$d_2 = 0.12 - 0.06 \text{ m}$$

$$d_1 = 0.04 - 0.02 \text{ m}$$

$$\mu = 0.45$$

$$\omega = 900 \text{ N}$$

Q1	9
Q2	9
Q3	0
Q4	0
Q5	7

25/50

50%

$$T = \frac{2 \mu \omega (r_2^3 - r_1^3)}{3 (r_2^2 - r_1^2)} \quad \checkmark$$

$$\frac{2 \times 0.45 \times 900 \times (0.06^3 - 0.02^3)}{3 \times (0.06^2 - 0.02^2)} \quad \checkmark$$

$$= \underline{17.55 \text{ Nm}} \quad \checkmark$$

$$P = \frac{2 \pi N T}{60}$$

$$\frac{2 \times \pi \times 1800 \times 17.55}{60} = 3308.1 \quad \checkmark$$

Question 1 - ii

$$\omega_i = \omega - (x \times k \times n)$$

$$\omega = 900 - (1.55 \times 25 \times 6) \checkmark = 667.5$$

✓ correct eqn.

$$T = \frac{0.45 \times 667.5 \times (0.06 + 0.02)}{2}$$

$$= \underline{\underline{12.015 \text{ Nm}}} \checkmark$$

Power?

9/10

Question 2

C) Per belt =

$$P = V (F_1 + F_2) = 17.02 (\text{was } 354.65 \text{ \& } 143.75)$$

$$P = 3562.29$$

$$n = \frac{\text{Power}}{\text{Power per belt}} = \frac{5000}{3562.29} = 1.403 \text{ belts}$$

so it needs

2 Belts

D)

Question 2

$$F_i = 230 \text{ N}$$

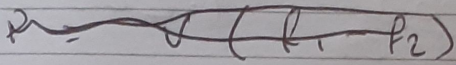
$$P = 5 \text{ kW} = 5000 \text{ W}$$

$$\omega = 2300$$

$$\mu = 0.4$$

$$\theta = 128^\circ = 2.23$$

$$\phi = 130 \text{ mm} = 0.13 \text{ m}$$

a)  $V = \frac{2\pi\omega r}{60}$

$$V = \frac{2\pi \times 2300 \times 0.065}{60}$$

$$V = \cancel{16.25} \quad \underline{\underline{17.02 \text{ m/s}}}$$

b) Stationary $F_1 + F_2 = \text{constant}$

$$F_1 + F_2 = F_i + F_i = 500 \text{ N} = \text{constant}$$

Powered $\frac{F_1}{F_2} = e^{\mu\theta} = e^{0.4 \times 2.23} = 2.44$

$$\frac{F_1}{F_2} = 2.44 \rightarrow F_1 = 2.44 F_2$$

$$F_1 + F_2 = 500$$

$$2.44 F_2 + F_2 = 500$$

$$3.44 F_2 = 500$$

$$F_2 = \frac{500}{3.44} = \underline{\underline{145.35 \text{ N}}}$$

$$F_1 = 2.44 \times 145.35$$

$$F_1 = \underline{\underline{354.65 \text{ N}}}$$

max

9/10

Question 5

a) the gears that need the same module and pitch are the gears that mesh together. ✓

b) $\frac{64}{32} \times \frac{36}{24} = 3 \text{ GR}$ ✓

$\text{GR} = 3:1$

2500
20 Nm $\boxed{0.85}$

$P_1 = \frac{2\pi NT}{60} = \frac{2\pi \times 2500 \times 20}{60} = 5235.99$ ✓

$T_1 = \frac{60 \times 5235.99}{2\pi \times 2500} = 20 \text{ Nm}$

this was given.

OUT PUT Direction is anticlockwise

c) $N_2 = \frac{N_1}{3} \times 2500 = 833.3 \text{ RPM}$ ✓
MISSING x
OUT PUT SPEED

$P_2 = \frac{P_1}{0.85} = \frac{P_1}{\eta} = P_2$

$= 5235.99 \times 0.85 = 4450.59 \text{ W}$ ✓
OUT PUT POWER.

$T_2 = \frac{60 \times 4450.59}{2\pi \times 833.3} = \frac{60 \times 4450.59}{2\pi \times 833.3} = 51.002 \text{ Nm}$ ✓
holding torque.

+holding torque ??

Output

7/10