Assignment No. 5

1.



4.5kN

2kN-m     4kN-m

30°

0

2.1 cos 60°

60°

2.1 sin 60°

2.1 kN
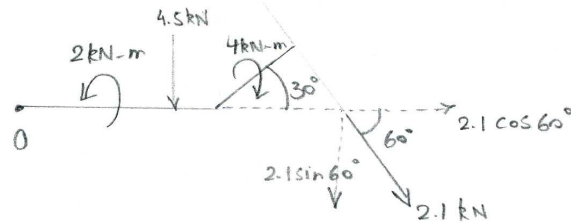
Replace the forces & couple with a single force
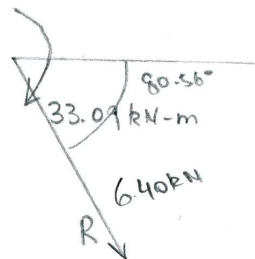
$$\Sigma F_x = 2.1 \cos 60 = 1.05 \text{ kN}$$

$$\Sigma F_y = 4.5 + 2.1 \sin 60° = 6.318 \text{ kN}$$

$$R = 6.40 \text{ kN}$$

$$\alpha = \tan^{-1} \frac{6.318}{1.05}$$

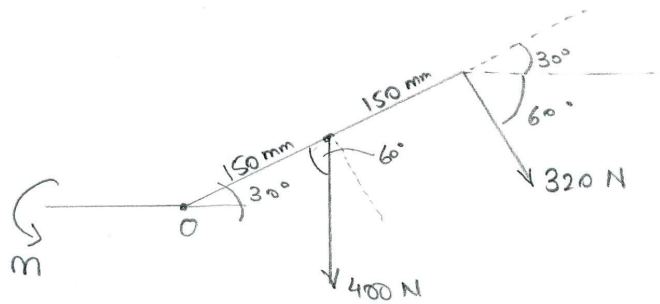$$M_0 = 2 - 4.5 \times 4 - 4 - 2.1 \sin 60 \times (2.309 + 5) = 80.56°$$

$$= 33.09 \text{ kN-m}$$



2
30°
x

$$\frac{2}{x} = \cos 30°$$

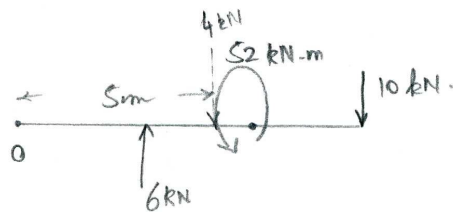$$x = 2.309 \text{ m}$$



80.56°

33.09 kN-m

6.40kN

R

2.



$$m = 400 \sin 60 \times 150 + 320 \times 300$$

$$= 148 \ N\text{-}m$$

3.



$$\Sigma F_y = 6 - 10 = -4$$
$$= 4 \ kN \downarrow$$

$$\Sigma M_o = 6 \times 3 - 90 + 52$$
$$= -72 + 52 = -20 \ kN\text{-}m$$
$$= 20 \ kN\text{-}/m \downarrow$$

$$d = \frac{+20}{4} = 5m$$

Bonus

$$\Sigma F_x = 90 + 90 + 90 = 270 \ kN \qquad \Sigma F_y = 0$$

$$R = 270 \ kN$$

$$\Sigma M_{CL} = 90 \times 12 + 90 \times 21 - 90 \times 21 = 1080 \ kN\text{-}m$$

$$d = \frac{1080}{270} = 4m \quad (\text{below the C.L})$$