U19CS012 (CD-12)

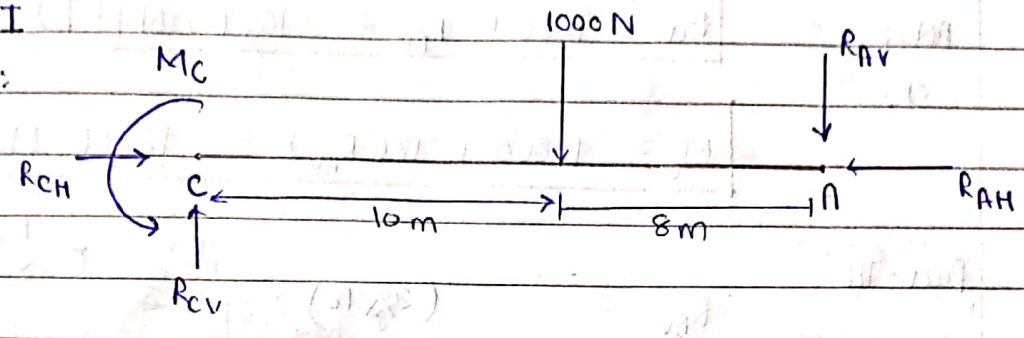
BEAM LECTURE ASSIGNMENT

Date: 6 May, 2020

56.) We divide the whole rod 3 parts from pins at A & B.

PART I

FBD :



① $\Sigma F_x = 0 \Rightarrow$ $R_{CH} = R_{AH} = 0$ (∵ no horizontal force)

② $\Sigma F_y = 0 \Rightarrow$ $R_{CV} - 1000 - R_{AV} = 0$

$$\boxed{R_{CV} - R_{AV} = 1000} \quad \text{— (i)}$$

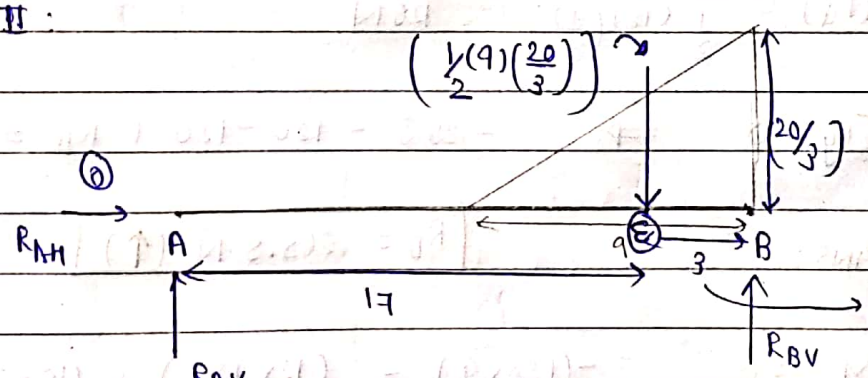
③ $\Sigma M_C = 0 \Rightarrow$

$$M_C - (1000 \times 10) - (18 \times R_{AV}) = 0$$

$$\boxed{M_C = 10000 + 18 R_{AV}} \quad \text{— (ii)}$$

PART II :

FBD



(Similarity Δ)

$\frac{x}{20} = \frac{9}{(9+18)}$

$x = 20 \times \frac{9}{27} = \frac{1}{3}$

Force at $E = \frac{1}{2} bh = \frac{1}{2}(9)\left(\frac{20}{3}\right) = (30)\ N$

$\Sigma F_y = 0 \Rightarrow$ $R_{AV} + R_{BV} - 30 = 0$

$$\boxed{R_{AV} + R_{BV} = 30} \quad \text{— (iii)}$$

$\Sigma M_A = 0$ $\quad -(17 \times 30) + (20 \times R_{BV}) = 0$

$$\boxed{R_{BV} = \frac{17 \times 30}{20} = 25.5\ N} \quad \text{— (iv)}$$

substituting R_{BV} in Eq^n ③ $\quad \boxed{R_{AV} = 4.5\ N}$ — (v)

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Substituting (v) in Eqn (i) & (ii)

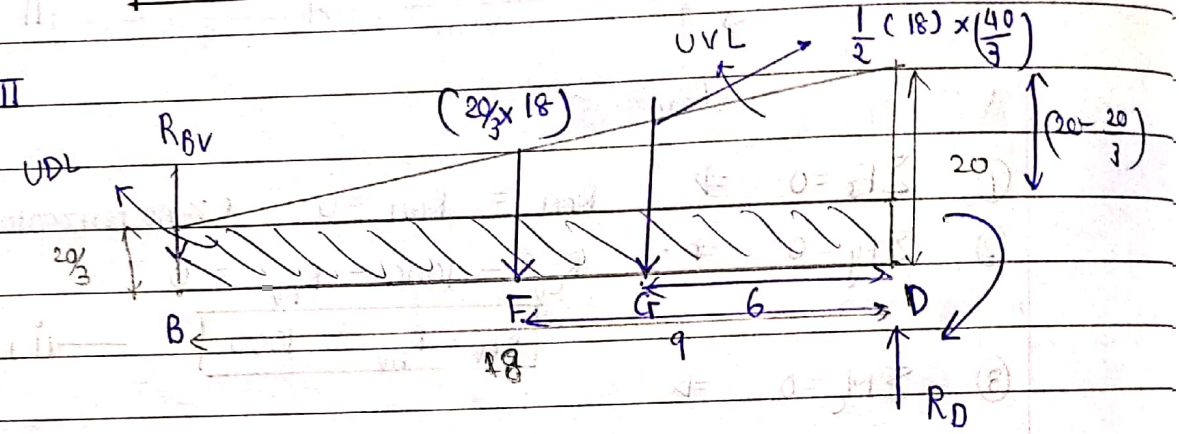
ANS:

$$R_{AV} = 1000 + R_{AV} = 1004.5\ N\ (\uparrow)$$

(i)

$$M_C = 10000 + 18(R_{AV}) = 10081\ Nm\ (C_W)$$

Part III



$$(F_F) = \frac{20}{3}\times 18 = 120\ N$$

$$(F_G) = \frac{1}{2}(18)\left(\frac{40}{3}\right) = 120\ N$$

$$\Sigma F_y = 0 \Rightarrow -25.5 - 120 - 120 + R_D = 0$$

ANS:

$$R_D = 265.5\ N\ (\uparrow)$$

$$\Sigma M_B = 0 \qquad -(120\times 9) - (12\times 120) + (18\times 265.5) - M_D = 0$$

$$M_D = 2259\ Nm\ (\circlearrowleft)$$

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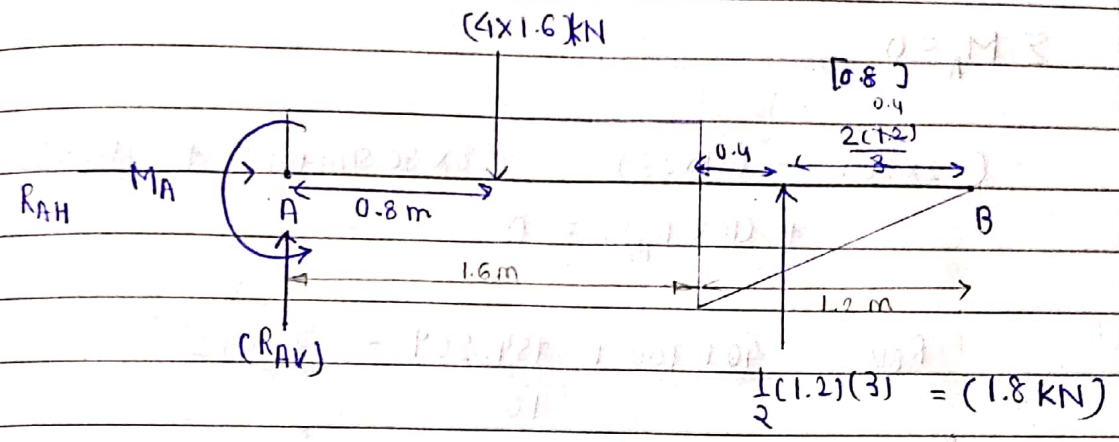
57.> FBD of AB Rod



$\Sigma F_x = 0 \Rightarrow \boxed{R_{AH} = 0}$ (No horizontal load)

$\Sigma F_y = 0 \Rightarrow R_{AV} - (6.4) + (1.8) = 0$

ANS:

$\boxed{R_{AV} = 4.6\ kN\ (\uparrow)}$

$\Sigma M_A = 0 \Rightarrow M_A - (0.8 \times 6.4) + (1.8 \times 2) = 0$

ANS:

$\boxed{m_A = 1.52\ kNm\ (\circlearrowleft)}$

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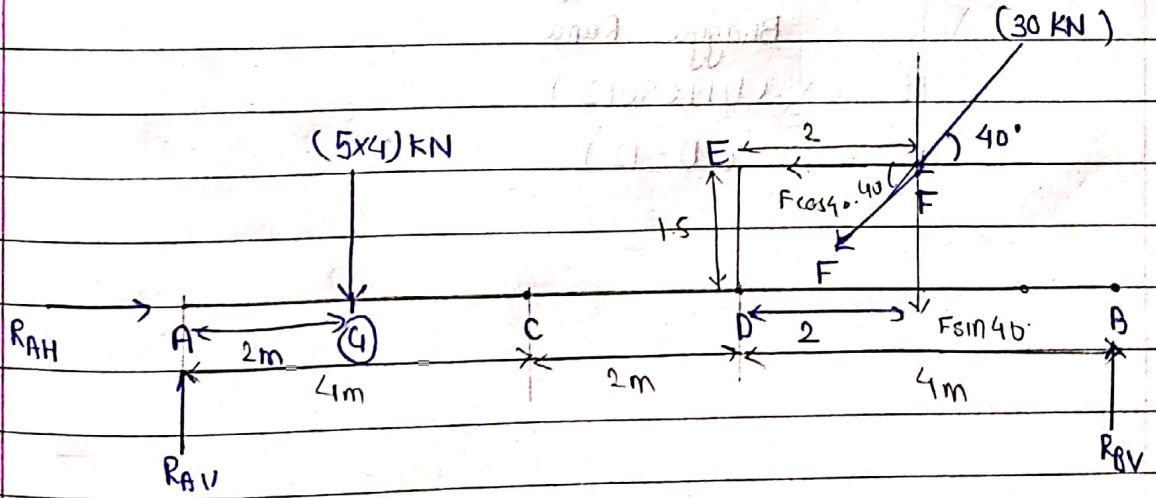

$\Sigma F_x = 0 \Rightarrow R_{AH} - 30\cos(40^\circ) = 0$

$\boxed{R_{AH} = 22.98\ kN\ (\rightarrow)}$

$\Sigma F_y = 0 \Rightarrow R_{AV} - 20 - 30\sin(40^\circ) + R_{BV} = 0$

$\boxed{R_{AV} + R_{BV} = 64.28}$ — (ii)

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$\Sigma M_A = 0$

$-(2 \times 20) - (4 \times 25) - (8 \times 30 \sin(40)) + 1.5 \times 30 \cos(40)$

$+ (10 \times R_{BV}) = 0$

$$R_{BV} = \frac{40 + 100 + 154.269 - 34.472}{10}$$

$$\boxed{R_{BV} = 25.9797 \text{ KN } (\uparrow)} \approx 25.98 \text{ KN } (\uparrow)$$

From Eqn (ii)

$R_{AV} = 64.28 - R_{BV}$

$$\boxed{R_{AV} = 38.3 \text{ KN } (\uparrow)}$$

×

Submitted By:

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