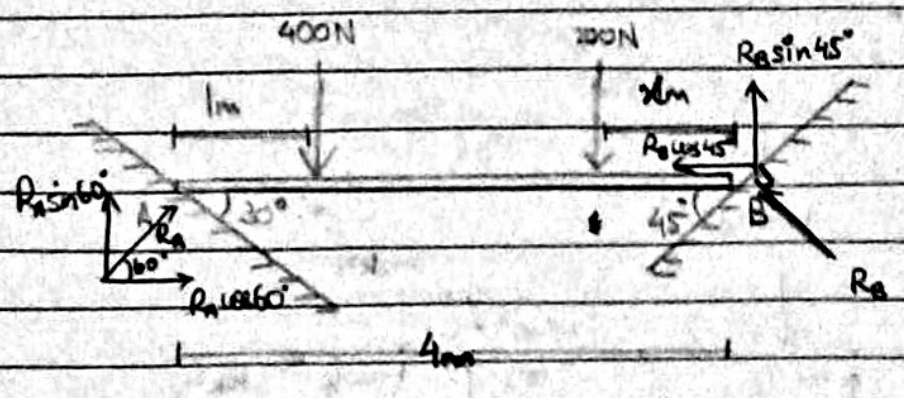
47_ YASH SARANG

LTCE

Assignment 4 : Beam Reactions

1) A weightless bar 4m long is placed at in a horizontal position on the smooth incline as shown. Find x at which the 200N force should be placed from point B to keep the bar horizontal.



System is in equilibrium, $\therefore \Sigma F_x = 0$. (→ tve)

$$R_A \cos 60 - R_B \cos 45 = 0 \quad \text{—— ①}$$

Also,

$\Sigma F_y = 0$ (↑ tve)

$$\therefore R_A \sin 60 + R_B \sin 45 - 400 - 200 = 0 \quad \text{—— ②}$$

from ① and ②,

we get $\boxed{R_A = 439.2N}$

$\boxed{R_B = 310.58N}$

$\Sigma M_B^F = 0$.

$$- R_A \sin 60° \times 4 + 400 \times 3 + 200 x = 0.$$

$\boxed{\therefore x = 1.607m}$

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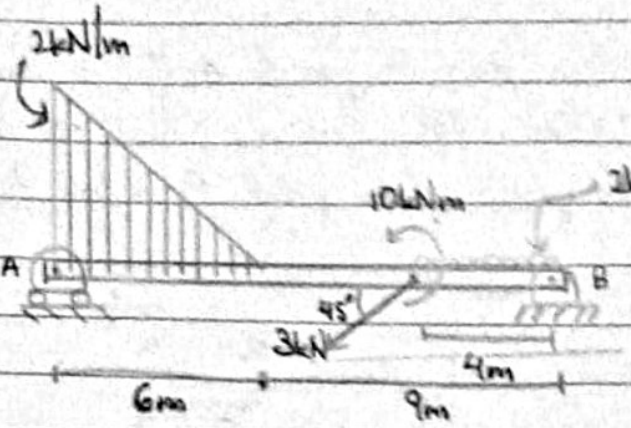
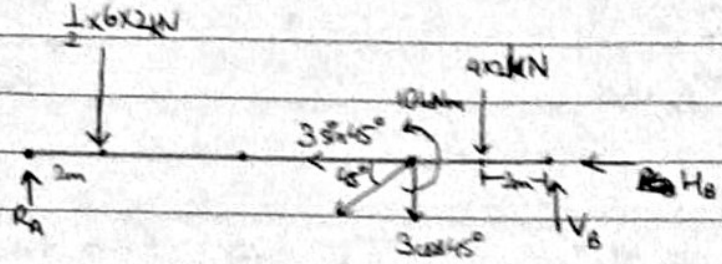
2) Find the reactions of the supports of the beam AB located as shown.



FBD:



System is in equilibrium, $\therefore \Sigma M_B^F = 0$ ($\circlearrowleft$ +ve)

$(8\times2) + (3\cos45\times4) + (6\times13) - R_A\times15 = 0.$

$\therefore R_A = 7.5\,kN\ (\uparrow)$

Also,

$\Sigma F_x = 0$ ($\rightarrow$ +ve)

$-3\sin45° - H_B = 0.$

$H_B = -3\frac{1}{\sqrt{2}} = 2.12\,kN\ (\leftarrow)$

$\therefore H_B = 2.12\,kN\ (\leftarrow)$

Also,

$\Sigma F_y = 0$ ($\uparrow$ +ve) $\quad \therefore V_B - 3\cos45 - 8 - 6 + R_A = 0.$

$\therefore V_B = 8.622\,kN\ (\uparrow)$

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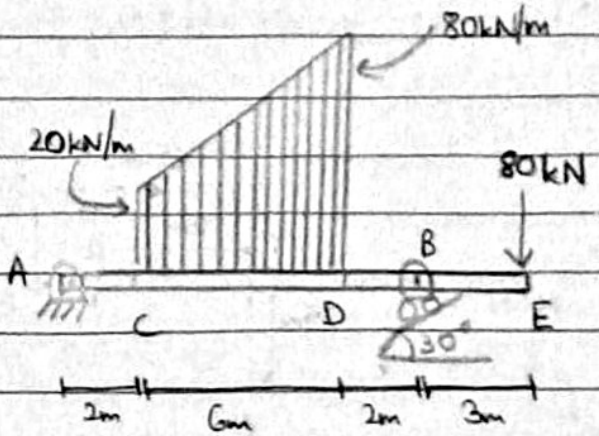
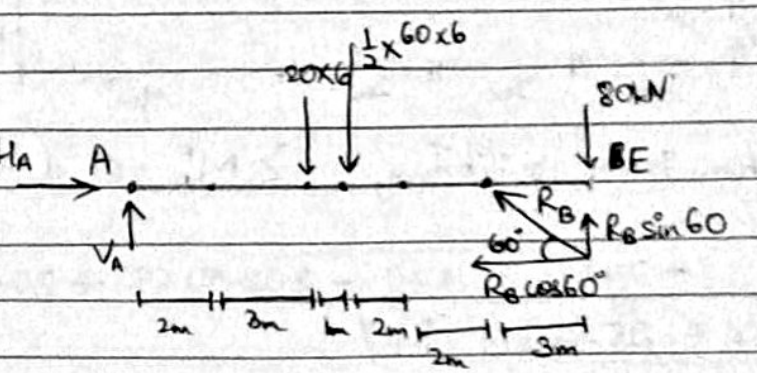
Assignment 4:

3) Find support reactions at A and B for the beam.



FBD.



System is in equilibrium,

$\therefore \sum M_A^F = 0.$

$-20\times6\times5 - \frac{1}{2}\times60\times6\times6 - 80\times13 + R_B \sin 60 \times 10 = 0.$

$\therefore R_B = 314.08\ kN\ (60°\ \nwarrow)$

Also, $\sum F_x = 0$ ($\rightarrow$ +ve) and $\sum F_y = 0$ ($\uparrow$ +ve)

$H_A - R_B \cos 60° = 0.$

$\therefore H_A = 157.04\ kN\ (\rightarrow)$

$V_A - 120 - 180 + R_B \sin 60 - 80 = 0.$

$\therefore V_A = 108\ kN\ (\uparrow)$

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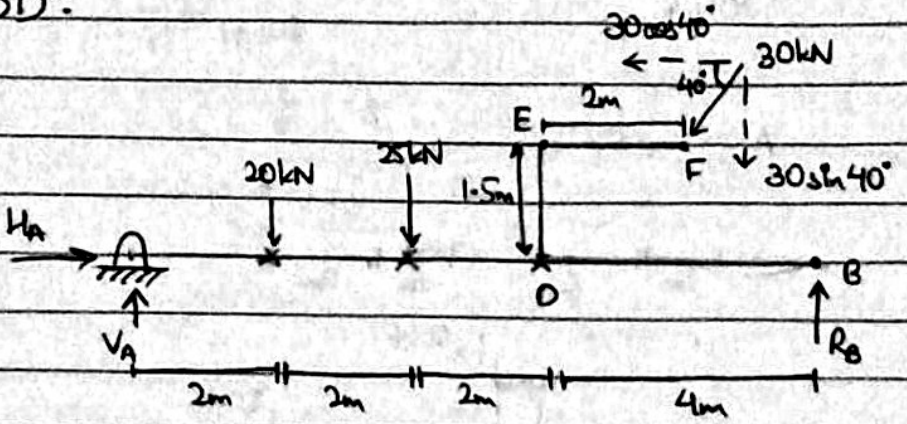
4) Figure shows beam AB hinged at A and roller supported at B. The L shaped portion DEF is an extended part of beam AB. For the loading shown, find support reaction.

FBD:



Since system is in equilibrium, $\Sigma M_A^F = 0$ (↺ +ve)

$$-20\times2 - 25\times4 - 30\sin40\times8 + 30\cos40^\circ\times1.5 + R_B\times10 = 0$$

$\therefore R_B = 25.98\ kN\ (\uparrow)$

also,

$\Sigma F_x = 0$ (→ +ve)

$H_A - 30\cos40^\circ = 0.$

$\therefore H_A = 22.98 kN\ (\rightarrow)$

and also,

$\Sigma F_y = 0$ (↑ +ve)

$V_A - 20 - 25 - 30\sin40 + R_B = 0.$

$\therefore V_A = 38.3 kN\ (\uparrow)$

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