Philadelphia University
Dep. Of Mech.Eng
Statics (620211)

Faculty of Engineering
2^d Exam: incomp.,2^d sem. 2015
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Name: ....
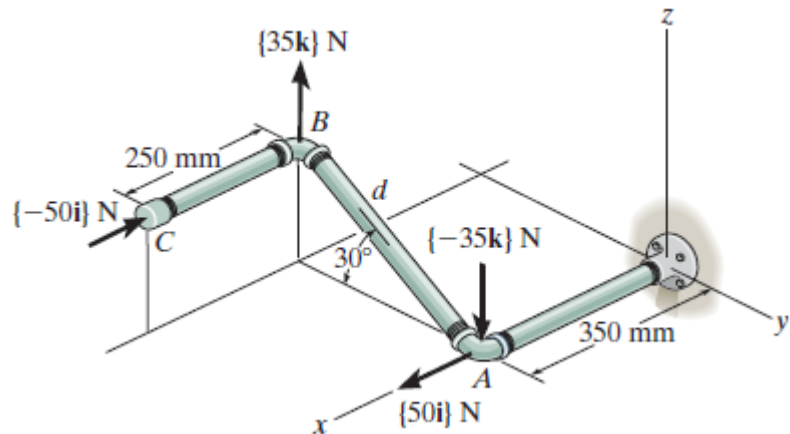
Serial number: ....   *Section:* ....

Quistion 1 *(6 marks)*

Determine the couple moment act on the pipe assembly. The distance from **A** to **B** is:
d$_{AB}$ = 400 mm. Express the result sa a Cartesian vector.

{35k} N

B

250 mm

{−50i} N

C

d

30°

{−35k} N

{−35k} N

350 mm

z

y

A

x   {50i} N

$$A = (0,35m, 0, 0)$$

$$B = (0,35, -y, z) ; \text{ where}: \cos 30° = \frac{y}{0,4} ; \Rightarrow y = 0,4 \cos 30 ; \boxed{y = 0,3464}$$

$$\sin 30 = \frac{z}{0,4} ; \Rightarrow z = 0,4 \sin 30° ; \Rightarrow \boxed{z = 0,2m}$$
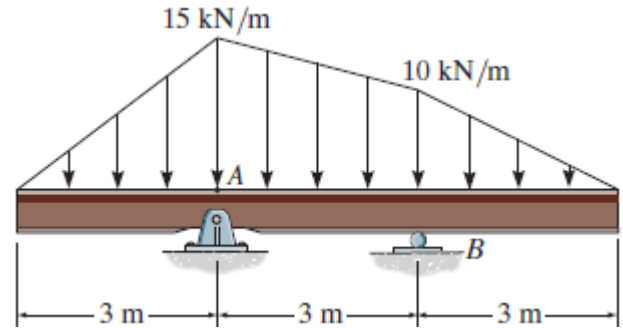
$$B(0,35; -0,3464; 0,2) \Rightarrow \bar{r}_{AB} = \{0i; -0,3464j; 0,2k\}m$$

$$(M_C)_2 = r_{AB} \times F_2$$

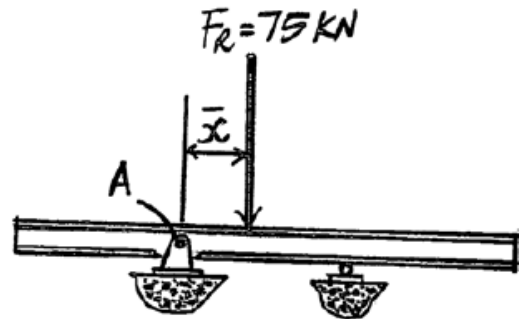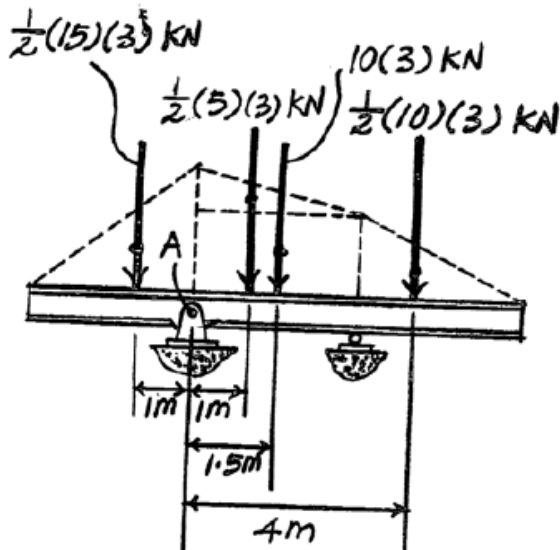$$= \begin{vmatrix} i & j & k \\ 0 & -0.3464 & 0.20 \\ -50 & 0 & 0 \end{vmatrix} = \{-10.0j - 17.32k\} \, N \cdot m$$

Replace the distributed loading by an equivalent resultant force, and specify its location measured from point **A.**

15 kN/m

10 kN/m

A

B

3 m   3 m   3 m

$+\downarrow F_R = \Sigma F_y;$ $F_R = \frac{1}{2}(15)(3) + \frac{1}{2}(5)(3) + 10(3) + \frac{1}{2}(10)(3) = 75\,\text{kN} \downarrow$ **Ans.**

$\zeta + (M_R)_A = \Sigma M_A;$ $-75(\bar{x}) = \frac{1}{2}(15)(3)(1) - \frac{1}{2}(5)(3)(1) - 10(3)(1.5) - \frac{1}{2}(10)(3)(4)$

$\bar{x} = 1.20\,\text{m}$

$\frac{1}{2}(15)(3)$ KN

$\frac{1}{2}(5)(3)$ KN

$10(3)$ KN
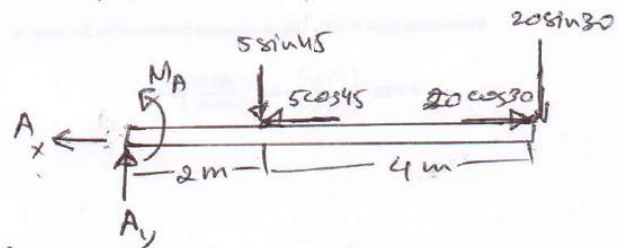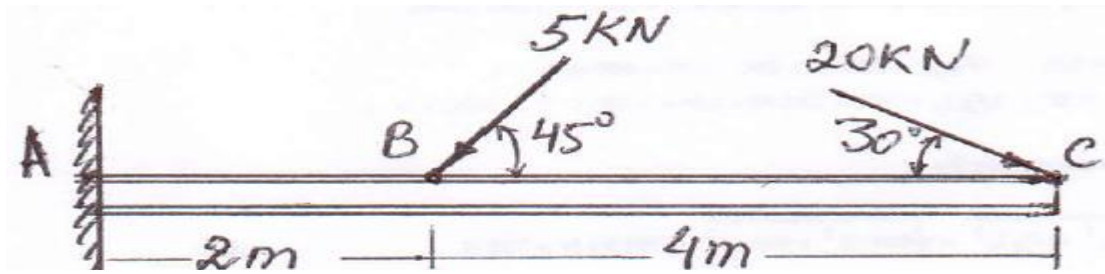
$\frac{1}{2}(10)(3)$ KN

A

1m 1m

1.5m

4m

$F_R = 75$ KN

$\bar{x}$

A

Quistion 2 *(7 marks)*

Determine the reaction support at fixed end A for cantilever beam loaded as shown in figure.

$$\xrightarrow{+} \Sigma F_x = 0 \implies (20\cos 30) - (5\cos 45°) - A_x = 0 \implies \boxed{A_x = 13.78 \, KN}$$

$$+\uparrow \Sigma F_y = 0 \implies (-5\sin 45) - (20\sin 30) + A_y = \implies \boxed{A_y = -13.53 \, KN}$$

$$\stackrel{+}{\curvearrowleft} \Sigma M_A = 0 \implies ((5\sin 45)(2)) - (20\sin 30 * 6) + M_A = 0 \implies \boxed{M_A = 67.07 \, KN \cdot m}$$