PROBLEM NO. 1-69	MECHANICAL ENGINEERING DEPARTMENT	NAME CDR DREON
DATE		SECTION 4322, 6521

Given: BEAM WITH A DISTRIBUTED LOAD OF 900 LBf/FT AND A CONCENTRATED LOAD OF 3200 LBf

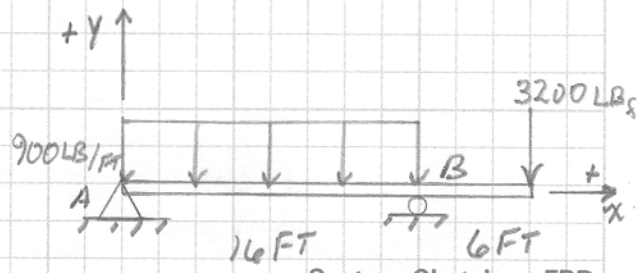
Find: SUPPORT REACTIONS
INTERNAL FORCE & MOMENT OF A TRANSVERSE SECTION 3 FT FROM PT A

Relationships:

$\xrightarrow{+} \Sigma F_x = 0$

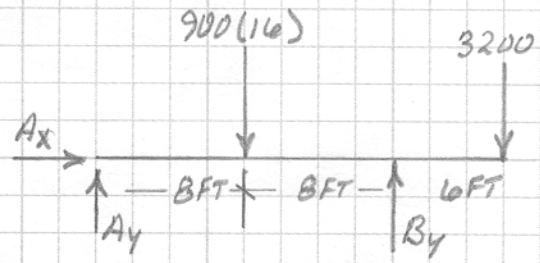
$+\uparrow \Sigma F_y = 0$

$+\circlearrowleft \Sigma M_P = 0$



System Sketch or FBD

Solution:



$\xrightarrow{+} \Sigma F_x = 0$
$A_x = 0$

$+\circlearrowleft \Sigma M_A = 0$

$-900(16)(8) + B_y(16) - 3200(22) = 0$

$-115200 + 16B_y - 70400 = 0$
$16B_y = 185600$

$B_y = 11600$ LBf

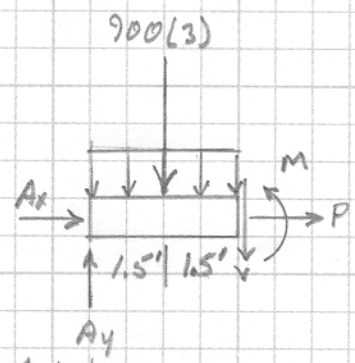
$+\uparrow \Sigma F_y = 0$

$A_y - 14400 + 11600 - 3200 = 0$

$A_y + 11600 - 17600 = 0$

$A_y = 6000$ LBf

CUT BEAM TO FIND INTERNAL FORCE & MOMENT



$\Sigma F_x = 0$
$P = A_x = 0$

$\Sigma F_y = 0$
$A_y - 900(3) - V = 0$

$6000 - 2700 = V$

$V = 3300$ LBf

$+\circlearrowleft \Sigma M_A = 0$
$M_z + 2700(1.5) - A_y(3) = 0$

$M_z + 4050 - 6000(3) = 0$

$M_z + 4050 - 18000 = 0$

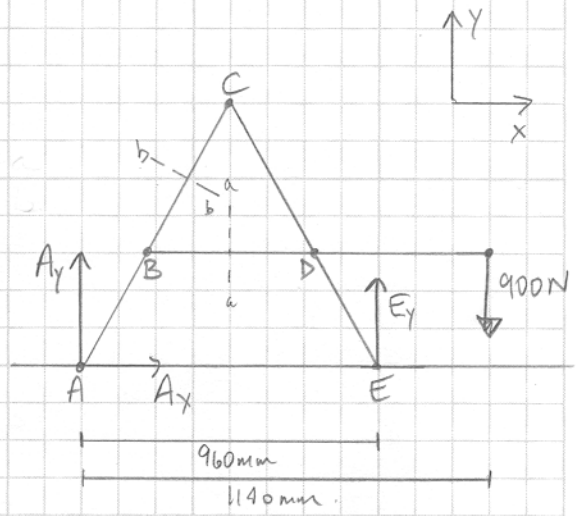
$M_z = 13950$ LBf

PROBLEM NO. 1-74	MECHANICAL ENGINEERING DEPARTMENT	NAME Koul
DATE		SECTION

Given: Fig P1-74

Find: P, V, M @ a-a in BD
" " b-b in ABC

Relationships:
$\Sigma F_x = 0$
$\Sigma F_y = 0$
$\Sigma M_z = 0$



System Sketch or FBD

Solution:

Find Reaction forces A_x, A_y, E_y

$\Sigma F_x = \boxed{A_x = 0}$

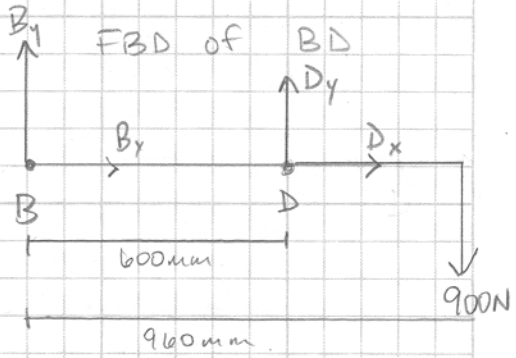
$\Sigma F_y = A_y + E_y - 900 = 0$

$\circlearrowleft + \ \Sigma M_A = E_y(960) - 900(1140) = 0$

$\boxed{E_y = 1069\,N}$ (correct as drawn)

$\boxed{A_y = -169\,N}$ (opposite of drawing)

Find reaction forces B_x, B_y, D_x, D_y



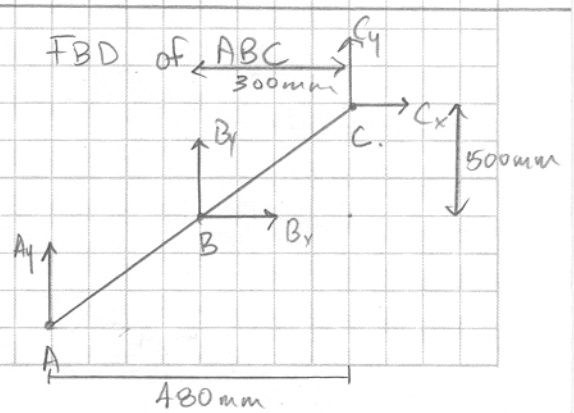
$\Sigma F_x = B_x + D_x = 0$

$\Sigma F_y = B_y + D_y - 900 = 0$

$\circlearrowleft + \ \Sigma M_B = D_y(600) - 900(960) = 0$

$\boxed{D_y = 1440\,N}$

$\boxed{B_y = -540\,N}$ (opp. of drawing)



$\Sigma F_x = B_x + C_x = 0$

$\Sigma F_y = A_y + B_y + C_y = 0$

$\boxed{C_y = 709\,N}$

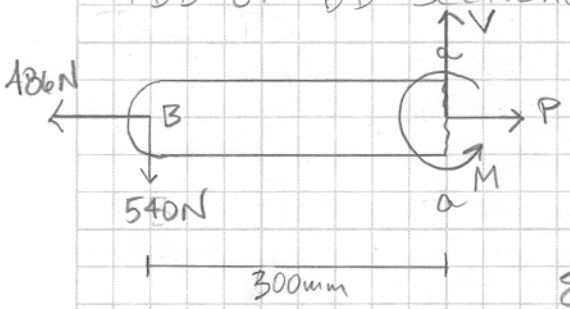
$\circlearrowleft + \ \Sigma M_C = B_x(500) - B_y(300) - A_y(480) = 0$

$\boxed{B_x = -486\,N}$ (opposite of drawing)

Solution: 1-74(2)

Find internal forces

FBD of BD sectioned at a-a



$\Sigma F_x = -486 + P = 0$

$\boxed{P = 486\,N}$ (tension)

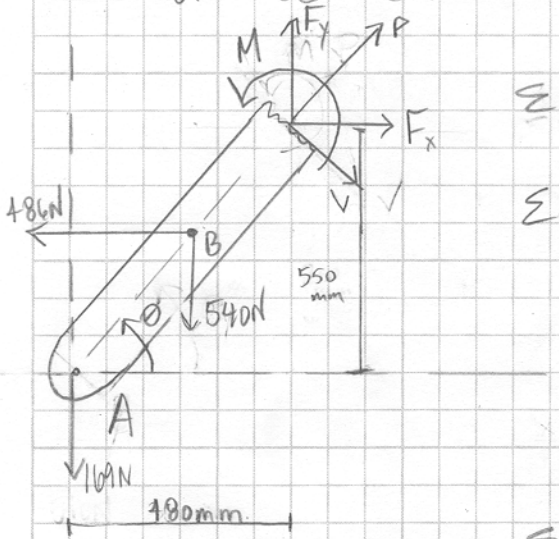
$\Sigma F_y = V - 540 = 0$

$\boxed{V = 540\,N}$

$\Sigma M_B = M + V(300) = 0$

$\boxed{M = -162\,N\cdot m}$ opp. sense than shown

FBD of ABC sectioned @ b-b



$\Sigma F_x = F_x - 486 = 0$

$F_x = 486\,N$

$\Sigma F_y = F_y - 540 - 169 = 0$

$F_y = 709\,N$

$P = F_x \sin 31° + F_y \sin 59°$

$\boxed{P = 858\,N}$ (tension)

$V = F_x \cos 31° - F_y \cos 59°$

$\boxed{V = 51.5\,N}$

$\Sigma M_{b\text{-}b} = M + 540(300) - 486(250) + 169(480) = 0$

$\boxed{M = -121620\,N\cdot mm}$ (opposite from drawing)

$\theta = \tan^{-1}\frac{300}{180} = 59°$

PROBLEM NO. 1-87	MECHANICAL ENGINEERING DEPARTMENT	NAME KOVL
DATE		SECTION

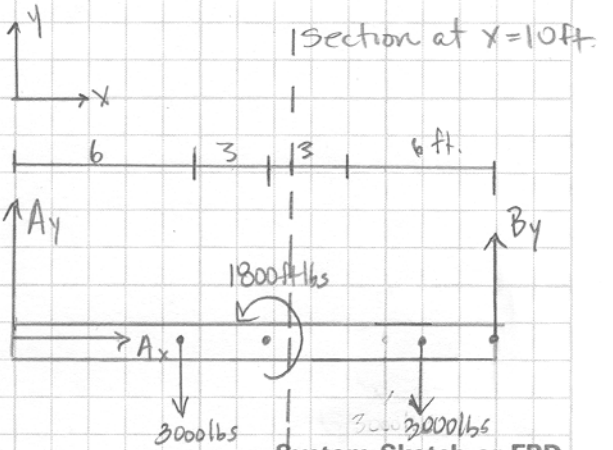
Given: Fig P1-87

Find: (a) Reaction forces A + B
(b) P, V, M on section shown

Relationships:

$\Sigma F_x = 0$
$\Sigma F_y = 0$
$\Sigma M_z = 0$

Dist force $\Rightarrow 500 \text{ lbs/ft}(6 \text{ ft}) = 3000 \text{ lbs}$



System Sketch or FBD

Solution:

(a) $\Sigma F_x = \boxed{A_x = 0}$

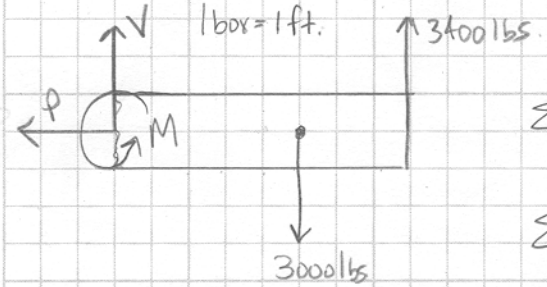
$\Sigma F_y = A_y - 3000 - 3000 + B_y = 0$

$\circlearrowleft + \Sigma M_A = -3000(6) + 1800 - 3000(15) + B_y(18) = 0$

$\boxed{B_y = 3400 \text{ lbs}}$

$\boxed{A_y = 2600 \text{ lbs}}$

(b) FBD of bar to the rt. of the section



$\Sigma F_x = -P = 0$ $\boxed{P = 0}$

$\Sigma F_y = V - 3000 + 3400 = 0$

$\boxed{V = -400 \text{ lbs}}$ (opposite of drawing)

$\circlearrowleft + \Sigma M_{section} = M + 3400(8) - 3000(5) = 0$

$\boxed{M = -12200 \text{ ft-lbs}}$ (opp of drawing)