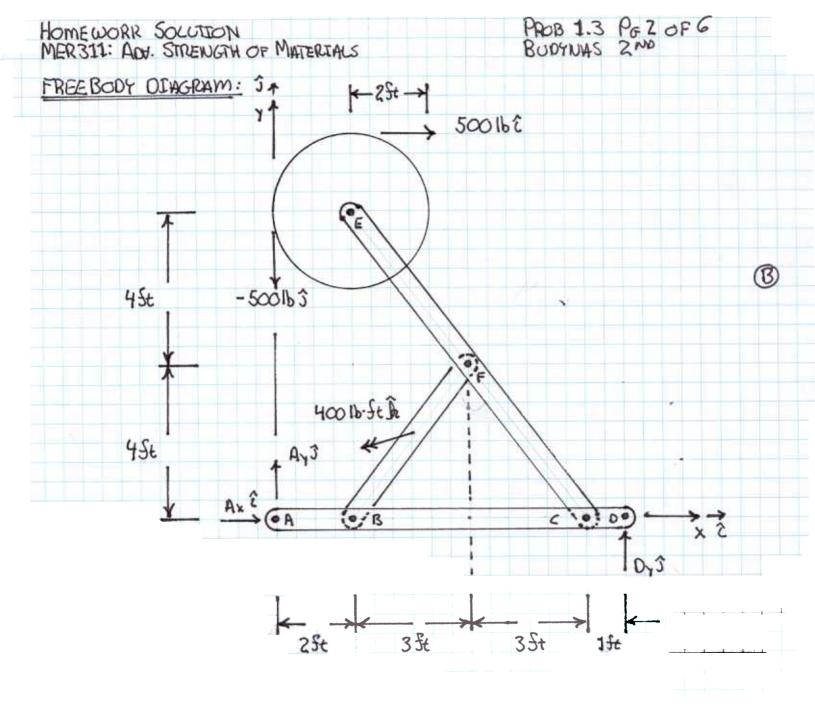
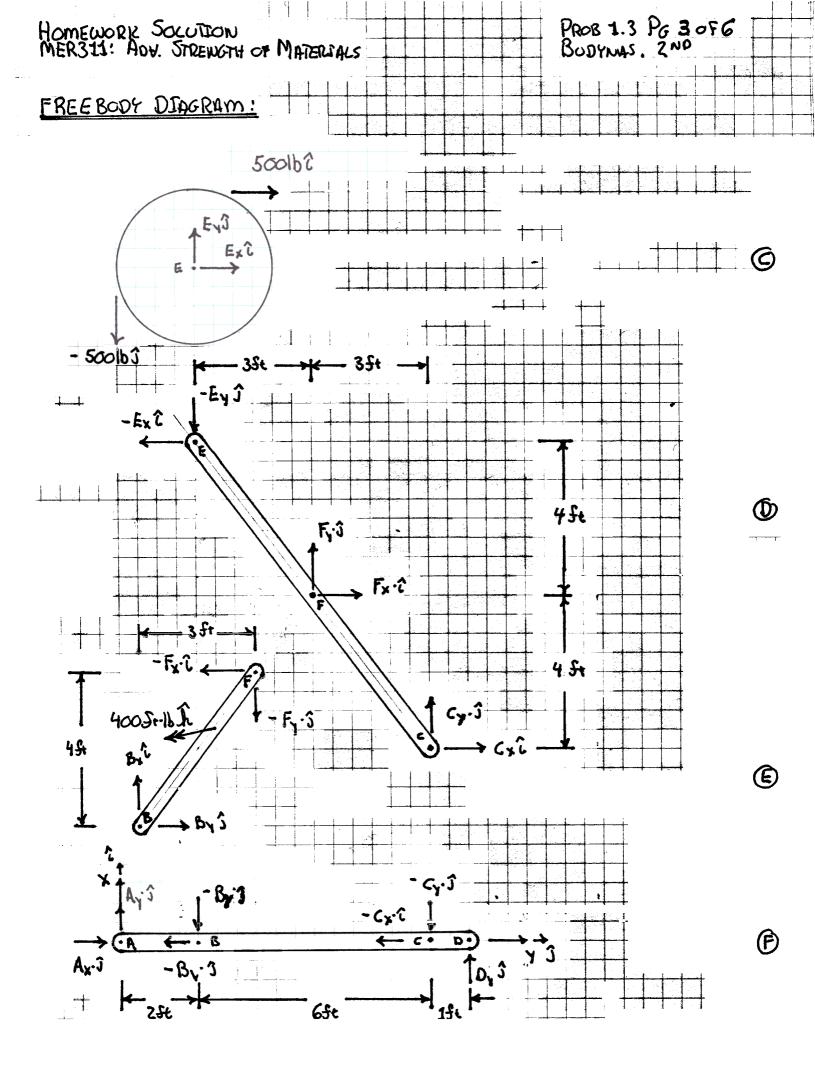
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SOLUTION:

THE SOLUTION STARTS BY CONSIDERING THE OVERHUL EQUILIBRIUM OF THE STRUCTURE. THE PREE BODY DIAGRAM FOR THE CYERACL STRUCTURE IS SHOWN IN B. USING EQUILIBRIUM

$$\Sigma f_{x} = 0 = A_{x} + 500 \text{ lb} \implies A_{x} = -500 \text{ lb}$$

$$\Sigma f_{y} = 0 = A_{y} + D_{y} - 500 \text{ lb} \implies A_{y} + D_{y} = 500 \text{ lb}$$

$$\Sigma M_{z} |_{eA} = 0 = 400 \text{ lb} \cdot 5t - (10f_{e}) \cdot (500 \text{ lb}) + (9f_{e}) \cdot D_{y}$$

$$\implies D_{y} = \frac{-400 \text{ lb} \cdot 5t + (105+) \cdot (500 \text{ lb})}{95t} = \frac{511.1 \text{ lb}}{95t}$$

SUBSTITUTING (3) INTO (2)

$$Ay = 5001b - Dy = 5001b - (511.11b) = -11.1 1b$$

NOW THAT THE EXTERNAL REASTIONS ARE RNOWN, THE INTERNAL REACTIONS CAN NOW BE CONSIDERED.

WHEEL E

CONSIDERING THE EQUILIBRIUM OF THE WHEEL, FIGURE (C)

$$\Sigma F_{x} = 0 = E_{x} + 500 \text{ lb} \implies E_{x} = -500 \text{ lb}$$

$$\Sigma F_{y} = 0 = E_{y} - 500 \text{ lb} \implies E_{y} = 500 \text{ lb}$$

BEAM EFC

CONSIDERING EQUILIBRIUM, FIGURE (1)

$$\Sigma F_{x} = 0 = -E_{x} + F_{x} + C_{x} = 500 \text{ lb} + F_{x} + C_{x}$$

$$\Sigma F_{y} = 0 = -E_{y} + F_{y} + C_{y} = -500 \text{ lb} + F_{y} + C_{y}$$

$$\Sigma M_{z}/_{@c} = 0 = (85\epsilon) \cdot (E_{x}) - (45\epsilon) \cdot (F_{x}) + (65\epsilon) \cdot (E_{y}) - (35\epsilon) \cdot (F_{y})$$

$$= (85\epsilon) \cdot (-500 \text{ lb}) - (45\epsilon) \cdot (F_{x}) + (65\epsilon) \cdot (500 \text{ lb}) - 35\epsilon \cdot F_{y}$$

$$= -4000 \cdot 5\epsilon \cdot \text{ lb} + 3000 \cdot 5\epsilon \cdot \text{ lb} - 45\epsilon \cdot F_{x} + 35\epsilon \cdot F_{y}$$

$$= -1000 \cdot 5\epsilon \cdot \text{ lb} - 45\epsilon \cdot F_{x} - 35\epsilon \cdot F_{y}$$

MER31	CRK SOLUTION PROB 1.3 PG 5 OF 6 : ADV. STRENGTH OF MATERIALS BUDYNAS, 2 NO	
10	20 St. 16 = 45t. Fx + 35t. Fy	10
IN TH	THREE EQUATIONS (8 - 10), THERE ARE FOUR UNKNOWNS: Fx, AND CY. SINCE NO UNIQUE SOLUTION CAN BE DETERMINED, ELEMENTS IN THE STRUCTURE NEED TO BE CONSIDERED	
BEAM	<u>BF</u>	
CONSI	ERING EQUILIBRIUN USING, FIGURE ©	
ΣF	$A_{x} = 0 = B_{x} - F_{x} = 0 \Rightarrow B_{x} = F_{x}$	11
Σf	=0 = By - Fy = 0 => By = Fy	(12)
ΣΙ	zles = 400ft-16 + 4ft. Fx - 3ft. Fy	
	$5 + 1b = 3 + F_y - 4 + F_x$	13
AND BE US	HE ADDITION OF THE BOAM "BF" EQUATIONS THERE ARE NOW SIX OWS (B)-(B) AND SIX UNKNOWNS. THIS SET OF EQUATIONS IN KNOWNS CAN BE SCHOOLD SIMULTANIONSCY. A MATRIX WILL O HERE TO SCHOOL THESE EQUATIONS. FIRST THE SIX	۷
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EQUAT AND BE US EQUAT B → (1) → (1) → (1) → (2) →	OWS (B) - (B) AND SIX UNKNOWNS. THIS SET OF EQUATIONS IN RWOWNS CAN BE SCIED SIMULTANIONS. A MATRIX WAS A HERE TO SCHE THESE EQUATIONS. FIRST THE SIX IONS NEED TO BE REWRITTEN AND THE PLACED IN MATRIX RESOLUTED TO BE REWRITTEN AND THE PLACED IN MATRIX RESOLUTED TO BE SET OF FY. - 500 lb = Cy + Fy. O = Bx - Fx. O = By - Fy. 400 St.lb = -4St.Fx + 3St.Fy. -500 lb = 0.Bx + 0.By + Cx + 0.Cy + Fx + 0.Fy.	۷
EQUAT AND BE US EQUAT BY BY BY BY BY	ONS (B)-(B) AND SIX UNKNOWNS. THIS SET OF EQUATIONS IN RNOWNS CAN BE SOLVED SIMULTANIOUSLY. A MATRIX WAS A HERE TO SOLVE THESE EQUATIONS. FIRST THE SIX IONS NEED TO BE REWRITTEN AND THE PLACED IN MATRIX ROOTS OF BY FY - 500 lb = Cx + Fx 500 lb = Cy + Fy -1000 ft-lb = 4ft-Fx + 3ft-Fy O = Bx - Fx O = By - Fy 400 ft-lb = -4ft-Fx + 3ft-Fy -500 lb = 0.8x + 0.8y + Cx + 0.Cy + Fx + 0.Fy 500 lb = 0.8x + 0.8y + 0.Cx + Cy + 0.Fx + Fy	۷
EQUAT AND BE US EQUAT B → (1) → (1) → (1) → (1) → (1) → (1) →	CONS (8) - (3) AND SIX UNKNOWNS. THIS SET OF EQUATIONS IN RNOWNS CAW BE SOLVED SIMULTANIOSCY. A MATRIX WAS BELIEVED THESE EQUATIONS. FIRST THE SIX ICANS NEED TO BE RECURSTIEN AND THE PLACED IN MATRIX RESOLVED TO BE RECURSTIEN AND THE PLACED IN MATRIX RESOLVED TO BE RECURSTIEN AND THE PLACED IN MATRIX RESOLVED TO BE RECURSTION AND THE PLACED IN MATRIX RESOLVED TO BE RECURSTIVED TO BE R	۷

HOMEWORK SOLUTION
MER341: ADV. STRENGTH OF MATERIALS

PROB 1.3 PGG OF G BUDGNUS, 2 MB

WRITING THESE EQUATIONS IN MATRIX FORM

$$\begin{pmatrix}
-500 | b \\
500 | b
\end{pmatrix}$$

$$0 0 1 0 1 0 1$$

$$500 | b
\end{pmatrix}$$

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USING EITHER EXCEL® OR MATLABO, THE SIX UNKNOWNS CAN NOW BE SOLVED.

G

64)

Now the final element of the structure can be considered Beam abod

CONSIDERING EGGGGBRIOM USING FIGURE (F)

$$\Sigma F_x = O = A_x - B_x - C_x$$

 $O = (-500 lb) - (-175 lb) - (-325 lb) = O V$

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

 $0 = (-111b) - (-100b) - (600b) + D \Rightarrow D = 5111b$

SUMMARY:

THE ADDITION OF THE COUDLE ON BEAM "BF" TURNED THIS INTO A HELY INTERESTING PROBLEM. BY DOING THIS, "BF" WAS NO LONGER A TWO FORCE MEMBER. THIS FORCED THE SOCITION TO CONSIDER TWO ELEMENTS OF THE STRUCTURE SIMULTANIOUSLY TO SOCKE FOR THE INTERNAL UNKNOWNS.

IT IS ALSO IMPORTANT TO NOTE THAT BEFORE THE INTERNAL EQUILIBIUM COULD BE CONSIDERED, THE EXTERNAL RENOTIONS HAD TO BE SOLVED FOR FIRST. THIS PROPLEM ALSO EMPHRSIZES THE NEED TO ADHERE TO STRICK SIGN CONTENTIONS.