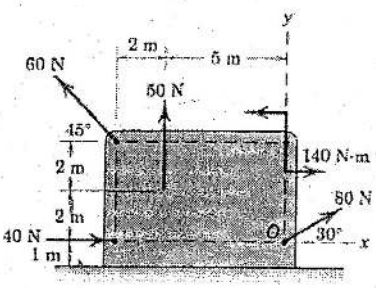
Ans Q:1 # 5 *marks*



$[R_x = \Sigma F_x]$ $R_x = 40 + 80\cos 30° - 60\cos 45° = 66.9\ \text{N}$

$[R_y = \Sigma F_y]$ $R_y = 50 + 80\sin 30° + 60\cos 45° = 132.4\ \text{N}$

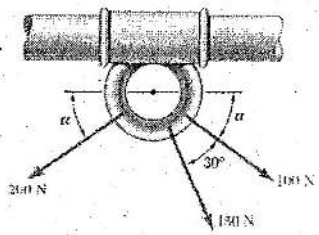
$[R = \sqrt{R_x^2 + R_y^2}]$ $R = \sqrt{(66.9)^2 + (132.4)^2} = 148.3\ \text{N}$ *Ans.*

$\left[\theta = \tan^{-1}\dfrac{R_y}{R_x}\right]$ $\theta = \tan^{-1}\dfrac{132.4}{66.9} = 63.2°$ *Ans.*

$[M_O = \Sigma(Fd)]$ $M_O = 140 - 50(5) + 60\cos 45°(4) - 60\sin 45°(7)$

$= -237\ \text{N}\cdot\text{m}$

Ans. Q:2 # 5 *marks*



$F_x = 0$

$100\cos\alpha + 150\cos(\alpha + 30) = 200\cos\alpha$

$\cos(\alpha + 30) = \cos\alpha\cos 30 - \sin\alpha\sin 30$

$100\cos\alpha + 150\,(\cos\alpha\cos 30 - \sin\alpha\sin 30) = 200\cos\alpha$

$100\cos\alpha + 150\left(\dfrac{\sqrt{3}}{2}\cos\alpha - \dfrac{1}{2}\sin\alpha\right) = 200\cos\alpha$

Divide by $(\cos\alpha)$,

$100 + 150\left(\dfrac{\sqrt{3}}{2} - \dfrac{1}{2}\tan\alpha\right) = 200$ $\therefore\ \alpha =$ ° # 3 marks

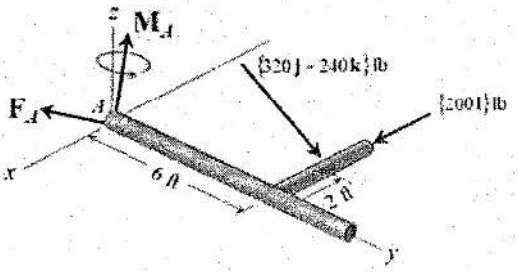
$$R = F_y = 100\sin\alpha + 150\sin(\alpha + 30) + 200\sin\alpha$$

Substitute for α =** °

$$R = F_y = 100\sin\alpha + 150(\cos\alpha\cos 30 + \sin\alpha\sin 30) + 200\sin\alpha = ** \quad N$$

2 marks

Ans. Q:3 # 5 ***marks***



$F_1 = 200\,i + 0\,j + 0\,k$

$F_2 = 0\,i + 320\,j - 240\,k$

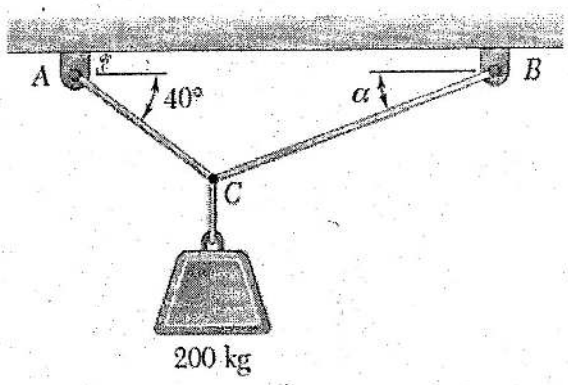
$R = 200\,i + 320\,j - 240\,k$ Ib

$$M_{A}^{\vec{F}_1} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -2 & 6 & 0 \\ 200 & 0 & 0 \end{vmatrix} = 0\hat{i} + 0\hat{j} - 1200\hat{k}$$

$$M_{A}^{\vec{F}_2} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -2 & 6 & 0 \\ 0 & 320 & -240 \end{vmatrix} = -1440\hat{i} - 480\hat{j} - 640\hat{k}$$

$$M = -1440\hat{I} - 480\hat{j} - 1840\hat{k} \qquad \text{lb.ft}$$

Ans.FQ:4 # 5 *marks*



For Equilibrium position : $F_x = 0$, $F_y = 0$

$$T_{CB}\cos 20° = T_{CA}\cos 40 \qquad N$$

$$T_{CB} = T_{CA} \times 0.77/0.94 \qquad N$$

$$F_{y_{@}} = 0$$

$$T_{CB}\sin 20° + T_{CA}\sin 40 = = 200 \times 9,8\ N$$

$$T_{CB} \times 0.34 + T_{CA} \times 0.64 = 200 \times 9,8\ N \qquad \text{.....equ. 2}$$

Solving of the two equs, gives T_{CB}, T_{CA}, **in equ 2 :**

$$T_{CB} \times 0.34 + T_{CA} \times 0.64 = 200 \times 9,8\ N$$

$$[(C \times 0.77)] \times 0.34 +](0.64T_{CA}) = 9.8 \times 200 \qquad N$$

$$\therefore \quad T_{CA} = ** \qquad N \qquad \#\ 5\ marks$$

Ministry of Higher Education
The Higher Institute of Engineering and Technology in New Damietta
Course Title: Mechanics-1
Course Code: ENG.101
Semester: 1st of 2019-2020 "Midterm Exam"

Model answer

Department: Basic Science
Level: 1
Time Allowed: 90 min.
Date: 28/7/2019, Sun.
Full Mark: 20
No. of exam Model pages: 4

مدخلات تحليل الورقه الامتحانية

Statics of Particles with Equilibrium in 2-D *(3 weeks, 6 Hrs)*

Q-2: Resultant of Several Concurrent Forces2D Concurrent forces (5 marks)

Q-4: Equilibrium of a Practice- Free Body Diagram *"Three Lectures"* (5 marks)

Statics of Rigid Particles 2 D and 3 D: *(3 weeks, 6 Hrs)*

Q-1:The force-couple system 2D-Concurrent forces- Rigid bodies (5 marks)

Q-3: The force-couple system 3D- Rigid bodies *"Three Lectures"* (5 marks)