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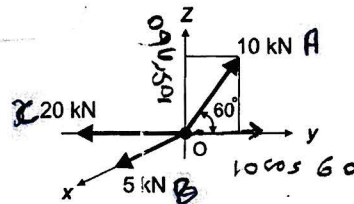
البيكانيك
Polytechnic
اجنة

لجنة الميكانيك - الإتجاه الإسلامي

Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering	
رقم الطالب :	إسم الطالب :
وقت المحاضرات :	مدرس الشعبة :

Statics First Exam – 7th November 2015^A

- 1- Show your detailed solutions on A4 Sheet, **Final Answers with No detailed solution will get ZERO** .
2- Choose one answer only for each question. If answers (a) to (e) are not correct, write your answer in (h)



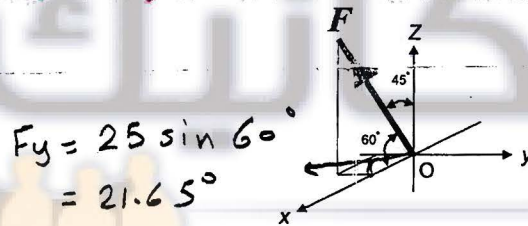
Q1- The three forces shown above act on a particle at O. Determine the following:

(1.1) The magnitude of the resultant force is:

- (a) 28.66 kN (b) 10 kN (c) 35 kN (d) 18.03 kN (e) 17.3 kN (h) -----

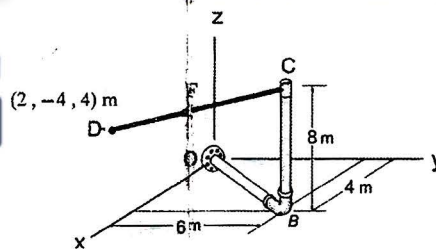
(1.2) The angle between resultant force and the positive y-axis is:

- (a) 101.5° (b) 106.4° (c) 146.3° (d) 60° (e) 33.7° (h) -----



Q2- The above Figure shows Force $F = 25 \text{ N}$. The magnitude of the component of F acting along y-axis is:

- (a) 12.5 N (b) 21.6 N (c) zero (d) 17.7 N (e) 10 N (h) -----



Q3- Force F moves along line CD . Given that $F = 80 \text{ N}$. Determine the following:

(3.1) The component of force F acting parallel to line CB is:

- (a) 16.8 N (b) 14.6 N (c) zero (d) 73.03 N (e) 58.42 N (h) -----

(3.2) The component of force F acting perpendicular to line CB is:

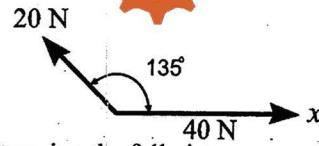
- (a) 58.5 N (b) 32.7 N (c) zero (d) 24.7 N (e) 40 N (h) -----

(3.2) The angle between force F and line CB is:

- (a) 79.5° (b) 68.58° (c) 155.9° (d) 30° (e) 24.1° (h) -----



لجنة الميكانيك - الإتجاه الإسلامي



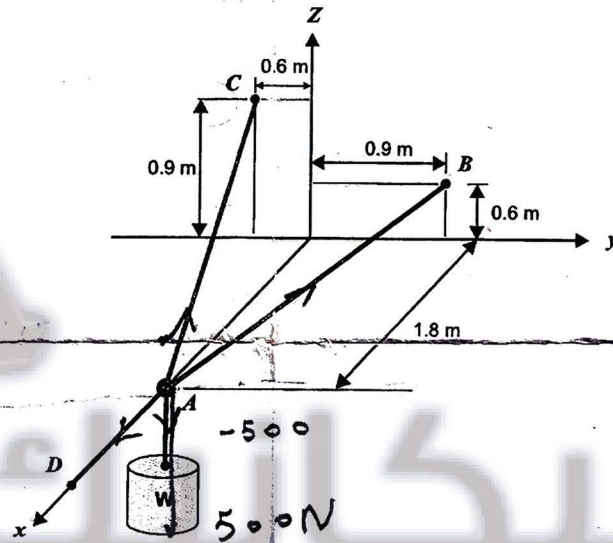
Q4- For the two forces shown above, determine the following:

(4.1) The magnitude of the resultant force F_R is:

- (a) 55.95 N (b) 60 N (c) 25.86 N (d) 29.47 N (e) 48.3 N (h) _____

(4.2) The angle measured counter-clockwise from the x -axis to F_R is:

- (a) zero (b) 28.7° (c) 45° (d) 135° (e) 331.7° (h) _____



Q5- Weight $W = 500 \text{ N}$ is supported by cables AB , AC and AD . Determine the following:

(5.1) The magnitude of the tension force in cable AB is:

- (a) 192 N (b) 147 N (c) 87 N (d) 374 N (e) 402 N (h) _____

(5.2) The magnitude of the tension force in cable AC is:

- (a) 412 N (b) 154 N (c) 333 N (d) 260 N (e) 200 N (h) _____

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لجنة الميكانيك - الإتجاه الإسلامي

الإجابة الإسلامية

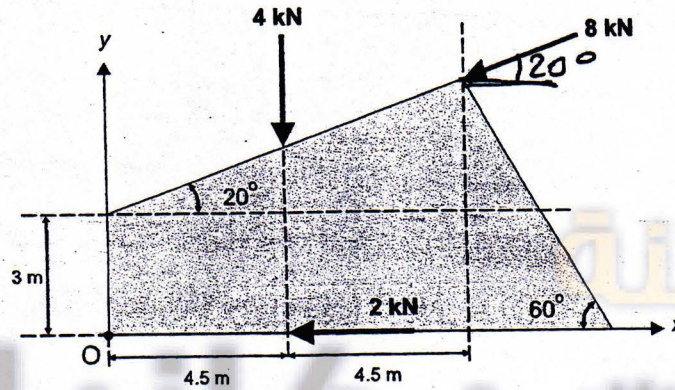
Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering	
رقم الطالب:	إسم الطالب:
وقت المحاضرات:	مدرس الشعبة:

Statics First Exam – 20th March 2014

Exam time: 50 minutes

ANSWER ALL QUESTIONS -WRITE YOUR FINAL ANSWERS ON THIS PAPER-

-SHOW YOUR CALCULATIONS ON THE ANSWER SHEET- Final answers with no solution will get ZERO



Q1- A system of three forces act on the body above, calculate the following:

(10 Marks)

- (A) The magnitude of the resultant force 11,664 kN (4 Marks)
 (B) The direction of the resultant force $\alpha = 144,7^\circ$; $\beta = 125,3^\circ$ (2 Marks)
 (C) The resultant moment about point O 4,55 kNm (4 Marks)

$$a) \vec{R} = (-8 \cos 20^\circ - 2) \vec{i} + (-4 - 8 \sin 120^\circ) \vec{j}$$

$$\vec{R} = (-9,52 \vec{i} - 6,74 \vec{j}) \text{ kN}$$

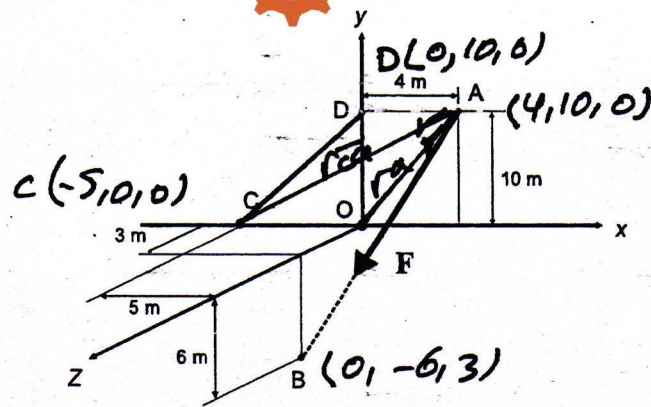
$$R = \sqrt{9,52^2 + 6,74^2} = 11,664 \text{ kN}$$

$$b) \alpha = \cos^{-1} \frac{-9,52}{11,664} = 144,7^\circ$$

$$\beta = \cos^{-1} \frac{-6,74}{11,664} = 125,3^\circ$$

$$c) M_O = -4 \cdot 4,5 + 8 \cos 20^\circ \cdot 3 = 4,55 \text{ kNm}$$





Q2- The force F ($F = 400$ N) acts in the direction AB . Determine the following: (10 Marks)

(a) The force F expressed as a Cartesian vector is $(-95,45i - 381,79j + 71,58k)$ N (3 Marks)

(B) The magnitude of the moment of force F about point O is $960,36$ N.m (4 Marks)

(C) The magnitude of the moment of force F about the axis CD is $256,1$ N.m (3 Marks)

$$a) \bar{F} = \frac{400}{\sqrt{4^2 + 16^2 + 3^2}} (-4i - 16j + 3k) = (-95,45i - 381,79j + 71,58k) \text{ N}$$

$$b) \bar{M}_O = \bar{r}_A \times \bar{F} ; \bar{r}_A = (4i + 10j + 0k) \text{ m}$$

$$\bar{M}_O = \begin{vmatrix} i & j & k \\ 4 & 10 & 0 \\ -95,45 & -381,79 & 71,58 \end{vmatrix} = (10 \cdot 71,58)i + (-4 \cdot 71,58)j + (-95,45 \cdot -381,79 + 10 \cdot 71,58)k$$

$$\bar{M}_O = (715,8i - 286,32j - 572,66k)$$

$$M_O = \sqrt{715,8^2 + 286,32^2 + 572,66^2} = 960,36 \text{ N.m}$$

$$c) \bar{r}_{CD} = (5i + 10j) \text{ m} ; r_{CD} = \sqrt{5^2 + 10^2} = 11,18$$

$$\alpha = \frac{5}{11,18} = 0,447 ; \beta = \frac{10}{11,18} = 0,894$$

$$\bar{M}_C = \bar{r}_{CA} \times \bar{F} = \begin{vmatrix} i & j & k \\ 9 & 10 & 0 \\ -95,45 & -381,79 & 71,58 \end{vmatrix} = (10 \cdot 71,58)i + (-9 \cdot 71,58)j + (-9 \cdot -381,79 + 10 \cdot 71,58)k$$

$$\bar{r}_{CA} = 9i + 10j + 0k$$

$$\bar{M}_C = (715,8i - 644,22j - 2481,61k)$$

$$M_{CD} = 715,8 \cdot 0,447 - 644,22 \cdot 0,894 = -256,1 \text{ N.m}$$

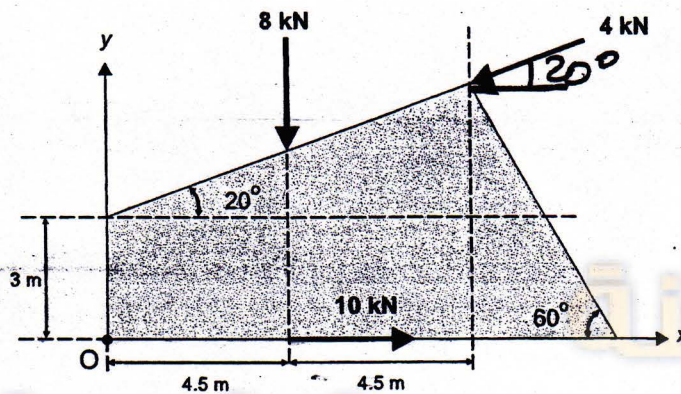
لجنة الميكانيك - الإتجاه الإسلامي

Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering	
رقم الطالب :	إسم الطالب :
وقت المحاضرات :	مدرس الشعبة :

Statics First Exam – 20th March 2014

Exam time: 50 minutes

ANSWER ALL QUESTIONS -WRITE YOUR FINAL ANSWERS ON THIS PAPER-
-SHOW YOUR CALCULATIONS ON THE ANSWER SHEET- Final answers with no solution will get ZERO



Q1- A system of three forces act on the body above, calculate the following:

(10 Marks)

- (A) The magnitude of the resultant force 11,258 kN (4 Marks)
- (B) The direction of the resultant force $\alpha = 56,34^\circ$; $\beta = 146,34^\circ$ (2 Marks)
- (C) The resultant moment about point O -24,72 kN.m (4 Marks)

$$a) \vec{R} = (-4 \cos 20^\circ + 10) \vec{i} + (-8 - 4 \sin 20^\circ) \vec{j}$$

$$\vec{R} = (6,24 \vec{i} - 9,37 \vec{j}) \text{ kN}$$

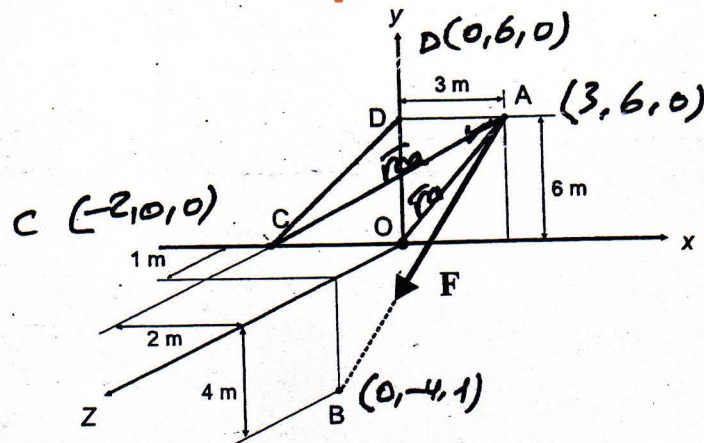
$$R = \sqrt{6,24^2 + 9,37^2} = 11,258 \text{ kN}$$

$$b) \alpha = \cos^{-1} \frac{6,24}{11,258} = 56,34^\circ$$

$$\beta = \cos^{-1} \frac{-9,37}{11,258} = 146,34^\circ$$

$$c) M_O = -8 \cdot 4,5 + 4 \cos 20^\circ \cdot 3 = -24,72 \text{ kN.m}$$





Q2- The force F ($F = 100$ N) acts in the direction AB . Determine the following: (10 Marks)

(a) The force F expressed as a Cartesian vector is $(-28,6i - 95,35j + 9,53k)$ N (3 Marks)

(B) The magnitude of the moment of force F about point O is $131,09$ N.m (4 Marks)

(C) The magnitude of the moment of force F about the axis CD is $-26,53$ N.m (3 Marks)

$$a) \vec{F} = \frac{100}{\sqrt{3^2 + 10^2 + 1^2}} (-3i - 10j + 1k) = (-28,6i - 95,35j + 9,53k) \text{ N}$$

$$b) \vec{M}_O = \vec{r}_A \times \vec{F} \quad ; \quad \vec{r}_A = (3i + 6j + 0k) \text{ m}$$

$$\vec{M}_O = \begin{vmatrix} i & j & k \\ 3 & 6 & 0 \\ -28,6 & -95,35 & 9,53 \end{vmatrix} = (6 \cdot 9,53)i + (-3 \cdot 9,53)j + (-3 \cdot 95,35 + 6 \cdot 28,6)k$$

$$\vec{M}_O = 57,18i - 28,59j - 114,45k$$

$$M_O = \sqrt{57,18^2 + 28,59^2 + 114,45^2} = 131,09 \text{ N.m}$$

$$c) \vec{r}_{CD} = (2i + 6j) \text{ m} \quad r_{CD} = \sqrt{2^2 + 6^2} = 6,32$$

$$\alpha = \frac{2}{6,32} = 0,316 \quad \beta = \frac{6}{6,32} = 0,949$$

$$\vec{M}_C = \vec{r}_{CA} \times \vec{F} \quad ; \quad \vec{r}_{CA} = (5i + 6j + 0k) \text{ m}$$

$$\vec{M}_C = \begin{vmatrix} i & j & k \\ 5 & 6 & 0 \\ -28,6 & -95,35 & 9,53 \end{vmatrix} = (6 \cdot 9,53)i + (-5 \cdot 9,53)j + (-5 \cdot 95,35 + 6 \cdot 28,6)k$$

$$\vec{M}_C = (57,18i - 47,65j - 305,15k)$$

$$M_{CD} = 57,18 \cdot 0,316 - 47 \cdot 0,949 = -26,53 \text{ N.m}$$



لجنة الميكانيك - الإتجاه الإسلامي

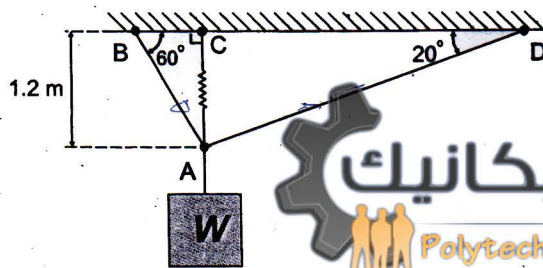
Al-Balqa Applied University Faculty of Engineering Department of Road and Bridge Engineering	رقم الطالب :	
وقت المحاضرات : 11:15 - 12:15	اسم الطالب :	د. محمد الرجوب
12:15 - 11:15	مدرس الشعبة :	

Statics first exam – 22nd June 2013

Exam time: 45 minutes

ANSWER ALL QUESTIONS -WRITE YOUR FINAL ANSWERS ON THIS PAPER-

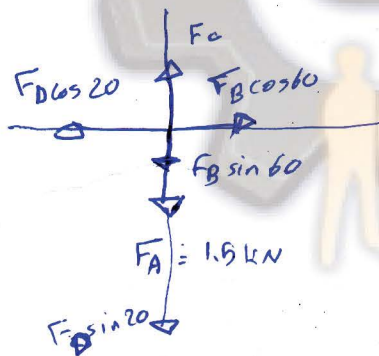
-SHOW YOUR CALCULATIONS ON THE ANSWER SHEET- Final answers with no solution will get **ZERO**



Q 1- The above weight W ($W=1.5$ kN) is held in equilibrium by cables AB, AD and spring AC. Given that the un-

stretched length of spring AC = 0.9 m, the spring constant, $k_{AC} = 1200$ N/m, calculate the following: (6 Marks)

- (a) The force in spring AC, $F_{AC} = 360$ N (2 Marks)
- (b) The force in cable AB, $F_{AB} = 1087.7$ N (2 Marks)
- (c) The force in cable AD, $F_{AD} = 578.6$ N (2 Marks)



$$\sum F_x = 0$$

$$F_B \cos 60 - F_D \cos 20 = 0$$

$$0.5 F_B = 0.94 F_D \Rightarrow F_B = 1.88 F_D$$

$$\sum F_y = 0$$

$$F_C - F_B \sin 60 - 1.5 - F_D \sin 20 = 0$$

$$F_C - 1.63 F_D - 1.5 - 0.34 F_D = 0$$

$$F_C - 1.97 F_D = 1.5 \quad \text{--- (2)}$$

$$\Rightarrow l_0 = 0.9 \text{ m}, L = 1.2$$

$$\omega L = l_0 + s \Rightarrow s = 0.3$$

$$\Rightarrow F_C = ks = (1200)(0.3) = 360 \text{ N} \quad \text{(a)}$$

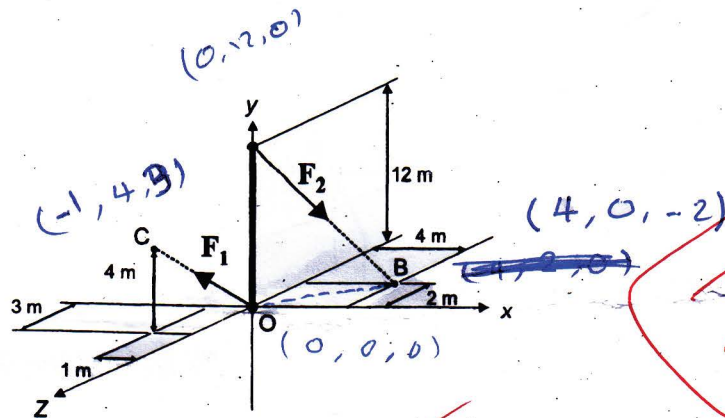
$$\Rightarrow 360 - 1.97 F_D = 1.5 \Rightarrow 1.97 F_D = -1140 \Rightarrow F_D = -578.6 \text{ N} \quad \text{(c)}$$

$$\Rightarrow F_B = -1087.7 \text{ N} \quad \text{(b)}$$



لجنة الميكانيك - الإتجاه الإسلامي

B (4, 0, -2)
C (-1, 4, 3)



Q 2- Force F_1 and F_2 are acting along the directions shown above. Given that the magnitude of $F_1 = 800$ N, $F_2 = 200$ N, Determine the following:

- (a) The resultant force (F_R) expressed as a Cartesian vector. $F_R = -97.6\hat{i} + 452.6\hat{j} + 448.8\hat{k}$ (7 Marks)
 (b) The magnitude of the resultant force $F_R = 644.8$ N (2 Marks)
 (c) The coordinate direction angles of the resultant force (F_R) are $\theta_x = 98.7^\circ$, $\theta_y = 45.4^\circ$, $\theta_z = 45.9^\circ$ (3 Marks)

$$* \vec{F}_1 = F_1 u_C = F_1 \left(\frac{-1\hat{i} + 4\hat{j} + 3\hat{k}}{\sqrt{26}} \right) = -160\hat{i} + 640\hat{j} + 480\hat{k}$$

$$\vec{F}_2 = F_2 u_B = F_2 \left(\frac{4\hat{i} - 12\hat{j} - 2\hat{k}}{\sqrt{164}} \right) = (0.312\hat{i} - 0.937\hat{j} - 0.156\hat{k}) 200 = 62.4\hat{i} - 187.4\hat{j} - 31.2\hat{k}$$

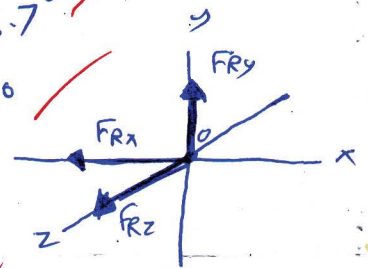
$$* \vec{F}_R = \vec{F}_1 + \vec{F}_2 = -97.6\hat{i} + 452.6\hat{j} + 448.8\hat{k} \quad \text{--- (a)}$$

$$|\vec{F}_R| = \sqrt{(-97.6)^2 + (452.6)^2 + (448.8)^2} = 644.8 \text{ N}$$

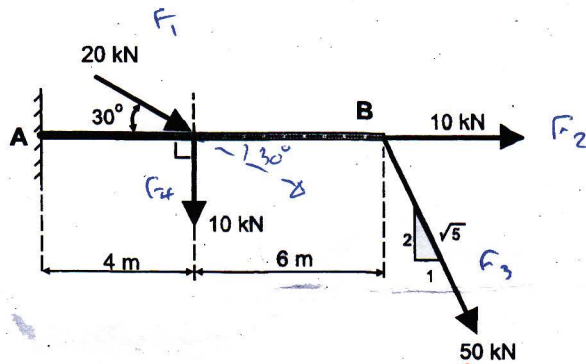
$$* \cos \theta_x = \frac{-97.6}{644.8} = -0.15 \Rightarrow \theta_x = 98.7^\circ$$

$$\cos \theta_y = \frac{F_y}{|F|} = \frac{452.6}{644.8} = 0.702 \Rightarrow \theta_y = 45.4^\circ$$

$$\cos \theta_z = \frac{F_z}{|F|} = \frac{448.8}{644.8} = 0.696 \Rightarrow \theta_z = 45.9^\circ$$



لجنة الميكانيك - الإتجاه الإسلامي



Q 3- The forces shown act on the body above. Determine the following:

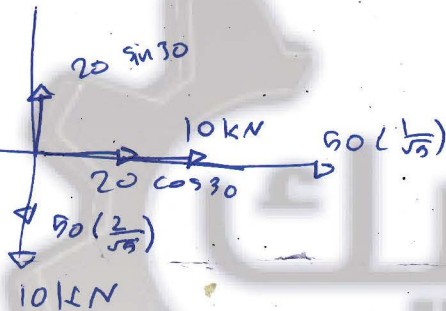
(7 Marks)

(a) The magnitude of the resultant force, $F_R = 81.57 \text{ kN}$

(3 Marks)

(b) The resultant moment of the forces about point A, $M_A = 647.2 \text{ kN.m}$

(4 Marks)



$$\vec{F}_R = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4$$

$$\vec{F}_1 = 20 \cos 30 \hat{i} - 20 \sin 30 \hat{j}$$

$$\vec{F}_1 = (17.3 \hat{i} - 10 \hat{j}) \text{ kN} \quad (1)$$

$$\vec{F}_2 = (10 \hat{i}) \text{ kN} \quad (2)$$

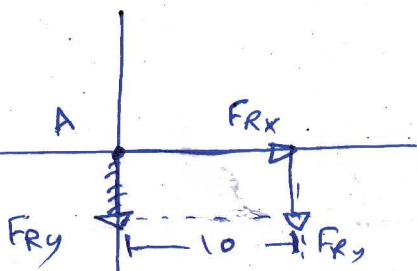
$$\vec{F}_3 = 50 \left(\frac{1}{5}\right) \hat{i} - 50 \left(\frac{2}{5}\right) \hat{j}$$

$$\vec{F}_3 = (22.36 \hat{i} - 44.72 \hat{j}) \text{ kN} \quad (3)$$

$$\Rightarrow \vec{F}_4 = (-10 \hat{j}) \text{ kN} \quad (4) \quad \text{so} \quad \vec{F}_R = (49.66 \hat{i} - 64.72 \hat{j}) \text{ kN}$$

$$|\vec{F}_R| = \sqrt{49.66^2 + (-64.72)^2} = 81.57 \text{ kN} \quad (a)$$

$$M_A = (F_{Ry})(10) = 647.2 \text{ kN.m} \quad (b)$$



لجنة الميكانيك - الإتجاه الإسلامي

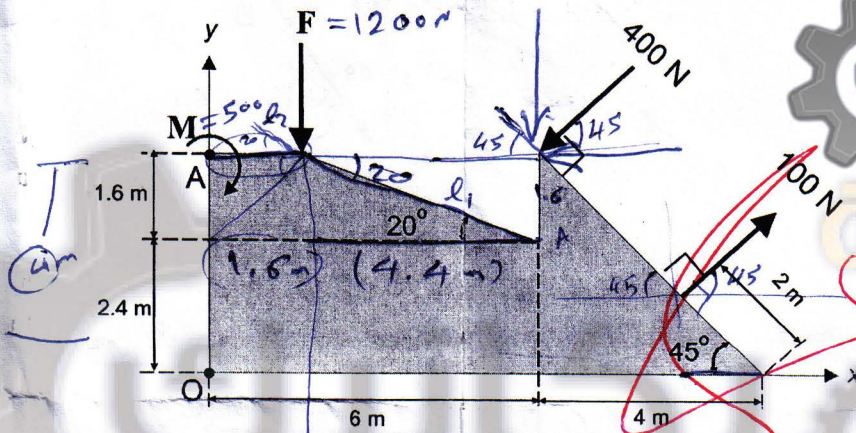
Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering	
رقم الطالب:	اسم الطالب:
وقت المحاضرات:	مدرس الشعبة:
٩٤٢ ١٢٨٠٠ - ١:٥٥	د. عبد جواد

Statics

First Exam – 7th November 2012

Exam time: 50 minutes

- 1- Choose one answer only for each question, empty or more than one answer are considered zero
- 2- Write your Name, your lecturer's name and time of your lectures up the page
- 3- If the answers (a) to (e) are not correct, write what you think is correct in (h)



Q1- The above shaded body is subjected to the shown forces and couple moment M acting at point A.

Given that $F = 1200$ N, and $M = 500$ N.m. Determine the following:

(8 Marks)

1.1 - The magnitude of the resultant force, F_R is:

(3 marks)

- (a) 1230.5 N (b) 602.7 N
(d) 800 N (e) 743.1 N

(c) 796.7 N

(h) ----- ~~1058.63~~

1.2 - The angle between F_R and the x axis measured clockwise is:

(1 marks)

- (a) 73.4° (b) 51.3°
(d) 23.4° (e) 34.2°

(c) 80.1°

(h) ~~78.46~~

1.3 - The moment of the system about point O is:

(4 marks)

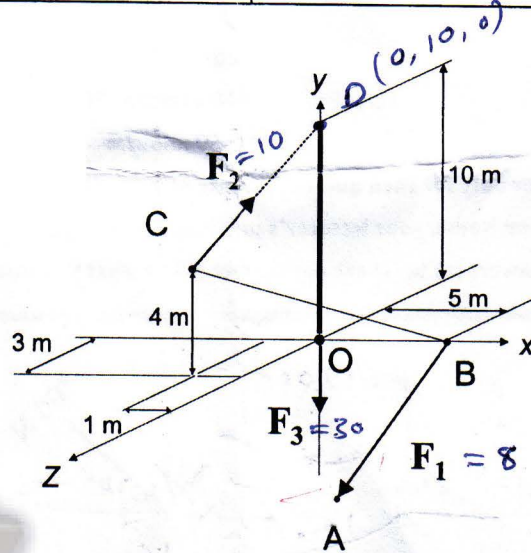
- (a) 262.8 N.m clockwise (b) 2.48 kN.m clockwise
(d) 3.56 kN.m clockwise (e) 2.06 kN.m clockwise

(c) 1.8 (kN)m anticlockwise

(h) -----

لجنة الميكانيك - الإتجاه الإسلامي

Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering	
رقم الطالب:	اسم الطالب:
وقت المحاضرات:	مدرس الشعبة:



Q2 - Given that: $F_1 = 8 \text{ kN}$, $F_2 = 10 \text{ kN}$, $F_3 = 30 \text{ kN}$. The coordinates of point A is $(1, -6, 4) \text{ m}$.

Determine the following:

(12 marks)

2.1 - The moment of F_2 about point B, expressed as a Cartesian vector is:

(4 marks)

(a) $(-30.7i - 15.3j - 35.8k) \text{ kN.m}$

(b) $(-44.2i - 22.1j - 59k) \text{ kN.m}$

(c) $(-15.4i - 7.7j - 17.9k) \text{ kN.m}$

(d) $(-35.4i - 17.7j - 47.2k) \text{ kN.m}$

(e) $(-12i - 15j - 9k) \text{ kN.m}$

(h) $(-44.108i - 22.062j + 58.518k)$

2.2 - The moment of F_1 about the y axis is:

(4 marks)

(a) -19.4 kN.m

(b) 3.9 kN.m

(c) 5.84 kN.m

(d) -11.68 kN.m

(e) -29.1 kN.m

(h) -160 N.m

2.3 - The magnitude of the resultant of the forces (F_1 , F_2 and F_3) is:

(4 marks)

(a) 23.6 kN

(b) 19.24 kN

(c) 16.6 kN

(d) 41.97 kN

(e) 27.09 kN

(h) (99.921 kN)



لجنة الميكانيك - الإتجاه الإسلامي

Al-Balqa Applied University
Civil Engineering
Department

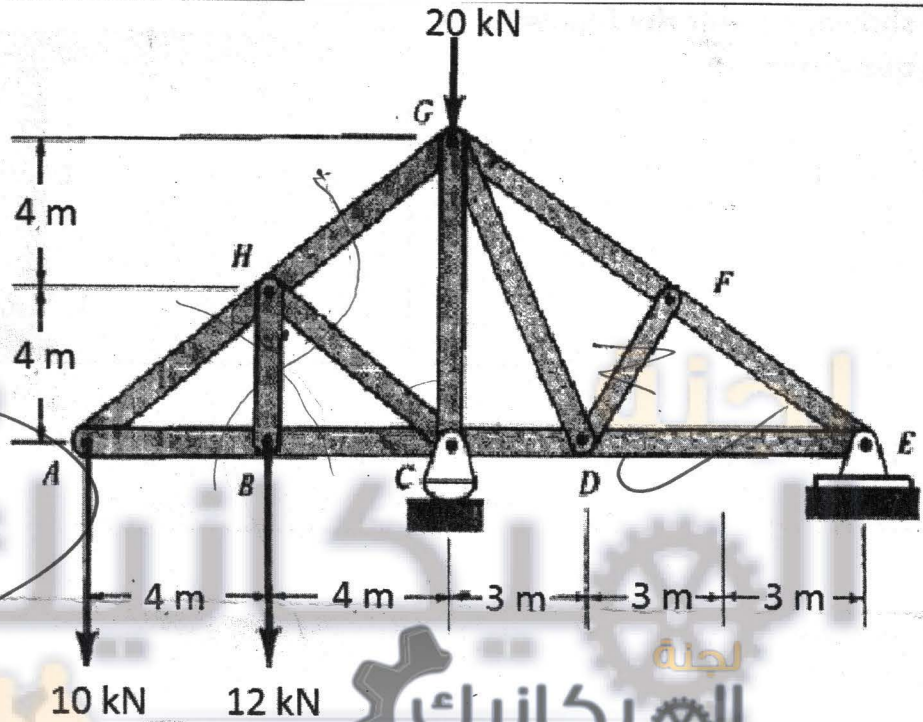
Statics, First exam
Saturday June 17, 2011
Time: 45 minutes, A

Instructors: Dr Muhammad
Rjoub
Dr Hassan Hajjeh
Dr Eed Al-Sahawneh

Name:

Problem # 1: 10 Points)

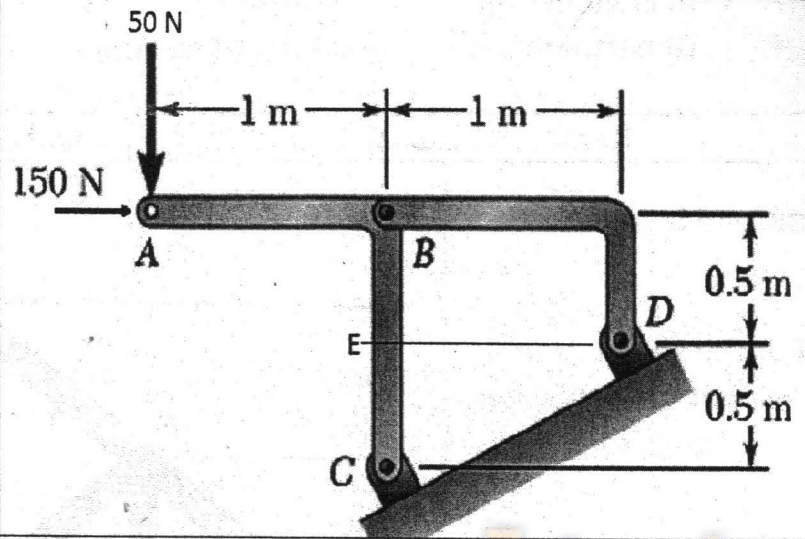
For the shown frame,
Answer the following
questions



- The reaction at C = 84.3 \uparrow KN
- Show zero force members by putting "Z" on the given sketch
- The force in member HB = 17.9 KN
- The force in member CH = KN
- The force in member HG = KN

Problem #2: (7 Points)

For the frame and loading shown, answer the following questions



The Reaction @ D, $R_D = 158.1$ N

The reaction at C : $C_x =$ N

$C_y =$ N

Polytechnic

لجنة الميكانيك - الإتجاه الإسلامي

Al- Balqa' Applied University

Faculty of Engineering Technology

Department Of Civil Engineering

Time: 1 hour

Statics

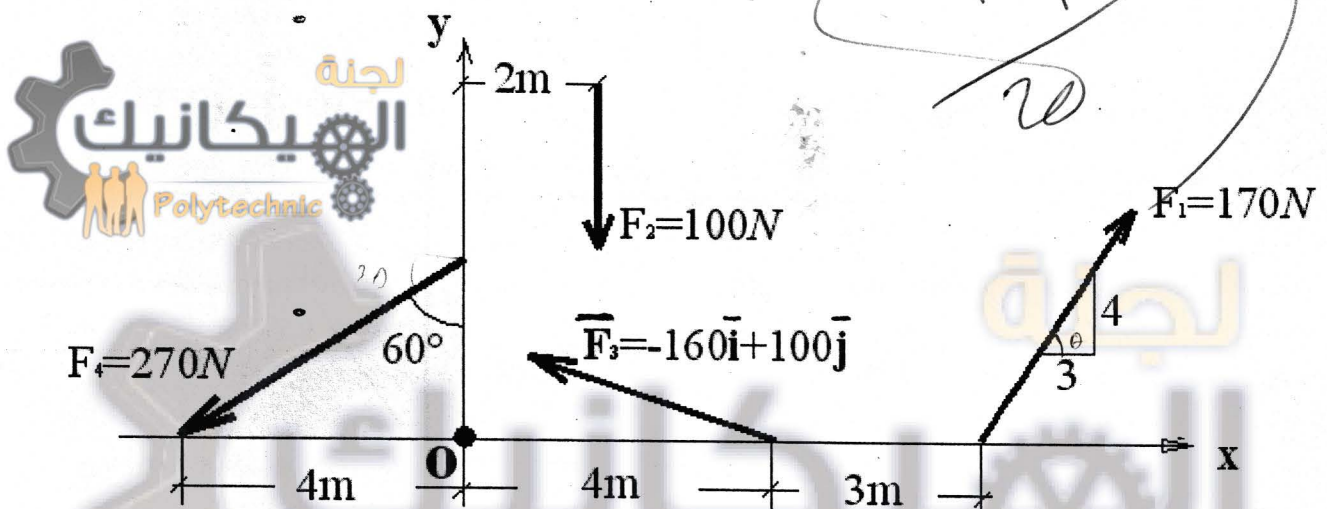
First exam 2011

مدرس الشعبة : د. محمد راجوب

إسم الطالب

وقت المحاضرات : ~~٢,٣~~ - ٣,٣ رقم الطالب :

Q1: For the planar forces shown, determine



The resultant \bar{R} for the four forces as a Cartesian vector. $\bar{R} = (-291.822\mathbf{i} + 100\mathbf{j})$ N

The magnitude of \bar{R} . $R = 291.822$ N

The direction cosines of the resultant \bar{R} for the four forces

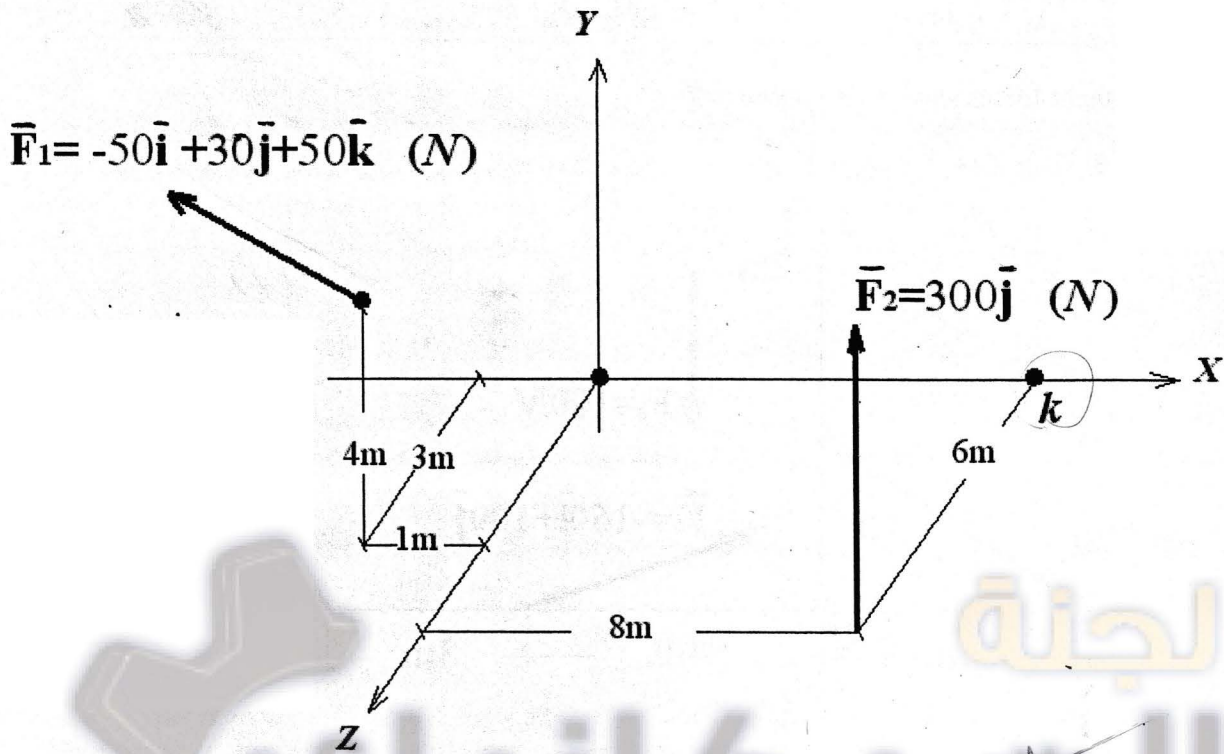
$\alpha = 1.79728787$ $\beta = 2.91822$ $\gamma = 0 \Rightarrow 90^\circ$

The magnitude of the moment of the four forces about the point O. $M_0 = 2$ N.m



لجنة الميكانيك - الإتجاه الإسلامي

Q2: For the space forces shown, determine



The resultant \bar{R} for the two forces as a Cartesian vector. $\bar{R} = (-50\bar{i} + 330\bar{j} + 50\bar{k}) \text{ N}$

The moment of the force \bar{F}_1 and \bar{F}_2 about the point k as a Cartesian vector. $\bar{M}_k = (-1690\bar{i} - 300\bar{j} - 70\bar{k}) \text{ N}$

The magnitude of \bar{M}_k . $M_k = 1717.25 \text{ N.m}$

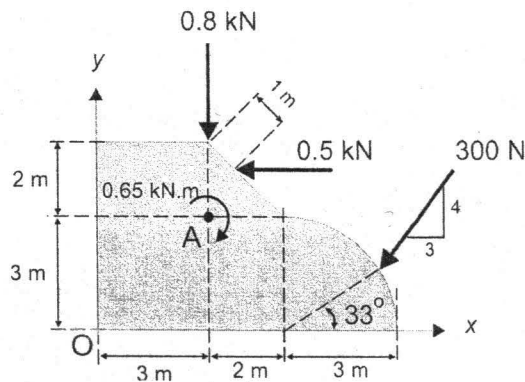
لجنة الميكانيك - الإتجاه الإسلامي

Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering	Time: 50 Minutes	اسم الطالب:
رقم الطالب:	وقت المحاضرات:	مدرس الشعبة:
	١٨ ٦٣٠ - ٩ -	د. محمد عيسى

Statics

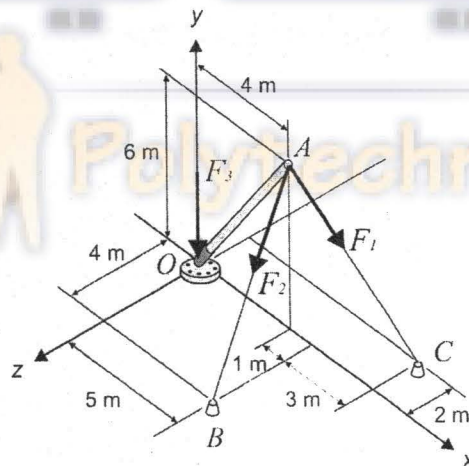
First Exam - 23rd November 2010

9/20



Q 1- For the forces and couple moment that act on the body above, calculate the following: (12 Marks)

- (a) The magnitude of the resultant force 1,018 kN (4 Marks)
 (b) The direction of the resultant force 72,8° (4 Marks)
 (c) The moment of the system about point O -6,628 (4 Marks)



Q 2- The pipe is subjected to forces $F_1 = 240$ N, $F_2 = 130$ N, $F_3 = 80$ N. Determine the following: (8 Marks)

- (a) The magnitude of the Resultant force F_R is 409,09 (3 Marks)
 (b) The coordinate direction angles of the Resultant force F_R are (3 Marks)
 (c) The resultant moment of the three forces about point O is 103,2 N (2 Marks)

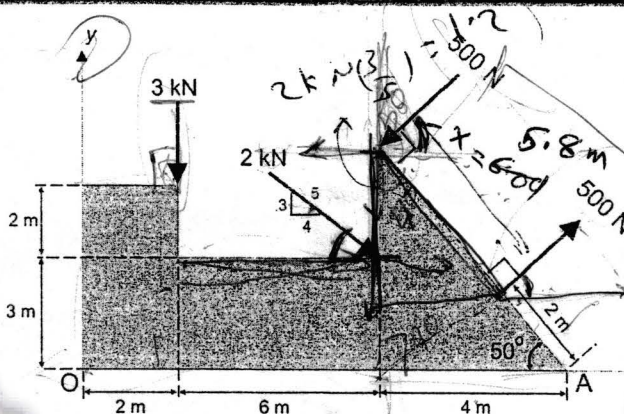
$\theta_x = 68,8$ $\theta_y = 12,5$ $\theta_z = 89,08$

لجنة الميكانيك - الإتجاه الإسلامي

Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering	
رقم الطالب : ٢٠٩١٥٠٢٤٠٤٧	إسم الطالب : د
وقت المحاضرات : ٥:٤٠ - ٤:٤٠	مدرس الشعبة : دفا محمد مرقبة

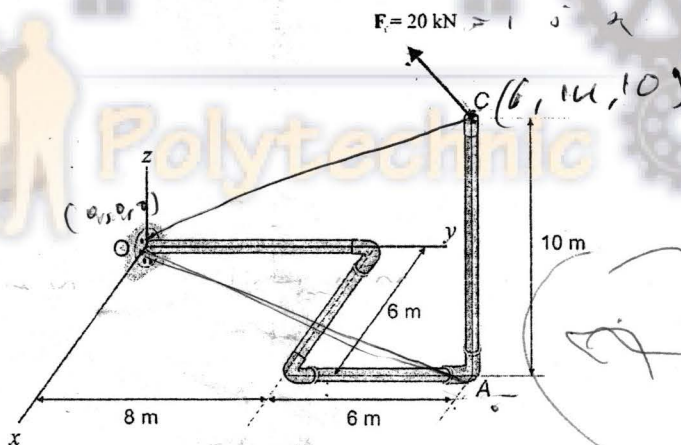
Statics

First Exam - 18th July 2010



Q 1- For the system of forces that acts on the body above, calculate the following: (10 Marks)

- (A) The magnitude of the resultant force 4.49 kN
- (B) The direction of the resultant force -69.1°
- (C) The moment of the system about point O -8.9 kN.m

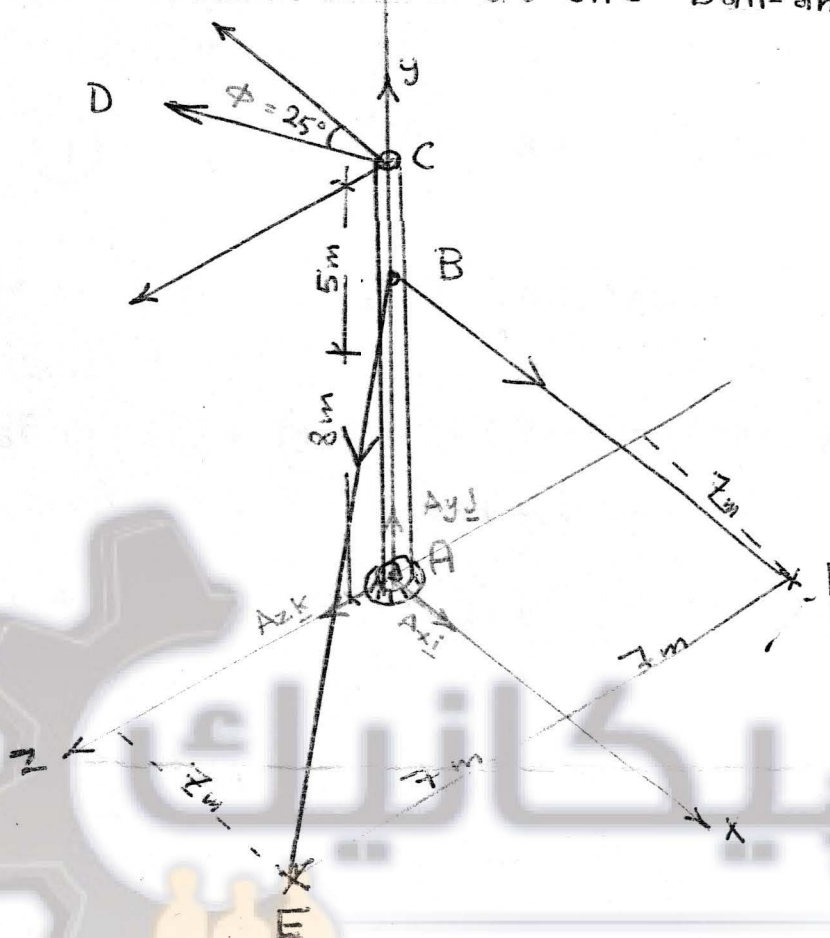


Q 2- The arrangement of pipes is subjected to force F as shown above. Given that force F has coordinate direction angles of: $\alpha = 60^\circ$, $\beta = 120^\circ$, $\gamma = 45^\circ$, determine the following: (10 Marks)

- (A) The moment of force F about the point O (M_O) $[297.96\hat{i} + 15.16\hat{j} - 200\hat{k}] \text{ kN.m}$
- (B) The magnitude of the moment of force F about the axis OA 102.41 kN

لجنة الميكانيك - الإتجاه الإسلامي

Knowing that the tension in cable CD = 14 kN.
 $\phi = 25^\circ$, Determine the tension in the cable
 and the reactions at the ball-and-socket joint A.



$$\vec{BF} = + (7m)\mathbf{i} - (8m)\mathbf{j} - (7m)\mathbf{k}$$

$$BF = \sqrt{(7)^2 + (-8)^2 + (-7)^2} = 12.73 \text{ m}$$

$$\vec{T}_{BF} = \frac{T_{BF} N}{12.73 \text{ m}} \left[(7m)\mathbf{i} - (8m)\mathbf{j} - (7m)\mathbf{k} \right]$$

$$\vec{T}_{BF} = T_{BF} \left((0.55)\mathbf{i} - (0.63)\mathbf{j} - (0.55)\mathbf{k} \right) \text{ N}$$

$$\vec{BE} = + (7m)\mathbf{i} - (8m)\mathbf{j} + (7m)\mathbf{k}$$

$$BE = \sqrt{(7)^2 + (-8)^2 + (7)^2} = 12.73 \text{ m}$$

$$\vec{T}_{BE} = \frac{T_{BE} N}{12.73 \text{ m}} \left[(7m)\mathbf{i} - (8m)\mathbf{j} + (7m)\mathbf{k} \right]$$

$$\vec{T}_{BE} = T_{BE} \left((0.55)\mathbf{i} - (0.63)\mathbf{j} + (0.55)\mathbf{k} \right)$$

لجنة الميكانيك - الإتجاه الإسلامي

$$\sum \vec{F} = 0 \quad A_x \underline{i} + A_y \underline{j} + A_z \underline{k} + T_{BF} + T_{BE} - 14 \cos 25^\circ \underline{i} + 14 \sin 25^\circ \underline{k} = 0$$

$$(A_x + 0.55 T_{BF} + 0.55 T_{BE} - 12.69) \underline{i} + (A_y - 0.63 T_{BF} - 0.63 T_{BE}) \underline{j} + (A_z - 0.55 T_{BF} + 0.55 T_{BE} + 5.92) \underline{k} = 0 \quad (1)$$

$$\sum M_A = 0 \quad r_{B/A} \times T_{BF} + r_{B/A} \times T_{BE} + r_{C/A} \times F_{CD} = 0$$

$$(8 \text{ m}) \underline{j} \times T_{BF} ((0.55) \underline{i} - (0.63) \underline{j} - (0.55) \underline{k}) + (8 \text{ m}) \underline{j} \times T_{BE} \underline{k} + (13 \text{ m}) \underline{j} \times (-12.69) \underline{i} + (5.92) \underline{k} = 0$$

$$-4.4 T_{BF} \underline{k} - 4.4 T_{BF} \underline{i} - 4.4 T_{BE} \underline{k} + 4.4 T_{BE} \underline{i} + (164.97) \underline{k} + (76.96) \underline{j} = 0 \quad (2)$$

بمسألة 8 معادلة في 3 محاور في (2) بالصفحة تكتب معادلاته

$$-4.4 T_{BF} - 4.4 T_{BE} = -164.97$$

$$-4.4 T_{BF} + 4.4 T_{BE} = -76.96$$

$$-8.8 T_{BF} = -241.93$$

$$T_{BF} = 27.49 \text{ KN}$$

$$T_{BE} = 10 \text{ KN}$$

بالعويض بالنسبة اعلاه في المعادلة (1) ونساواها معادله
 $\underline{i} < \underline{j} < \underline{k}$ بالصفحة

$$\underline{A} = -(7.93 \text{ KN}) \underline{i} + (23.62 \text{ KN}) \underline{j} + (3.70 \text{ KN}) \underline{k}$$



لجنة الميكانيك - الإتجاه الإسلامي

Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering	إسم الطالب : ذعيد سهاوتة
رقم الطالب : ٦٥٢ ١-١٣	مدرس الشعبة : ذعيد سهاوتة
وقت المحاضرات : ١-١٣	

Statics

First Exam – 19th March 2010

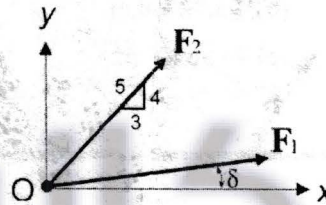
1- Choose one answer only for each question

2- If the answers (a) to (e) are not correct, write what you think is correct in (h)

3- Each question has 4 marks- 5 X 4= 20 Marks

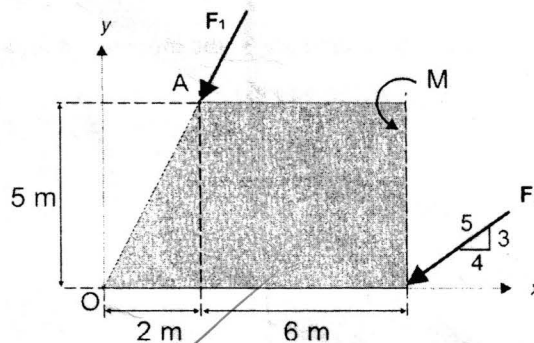
Q1- $F_1 = (50i - 100j + 600k)$ N, $F_2 = (0.45i - 1.2j - 0.6k)$ kN, then the magnitude of the resultant force is:

- (a) 1.72 kN (b) 3.32 kN (c) 0.8kN (d) 2.82 kN (e) 1.39 kN (h) -----



Q2- Forces F_1 and F_2 act on particle O. Given that $F_1 = 40$ N, $F_2 = 50$ N, $\delta = 10^\circ$, then the resultant force is: (4 Marks)

- (a) 90 N (b) 34.34 N (c) 83.77 N (d) 80.62 N (e) 54.7 N (h) -----

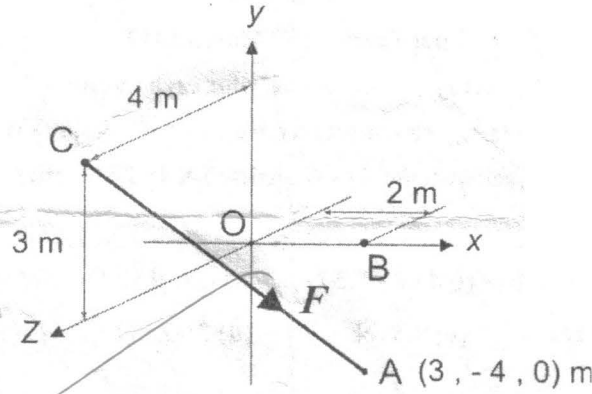


Q3- The above body is subjected to the shown forces and moment (Force F_1 acts along the face AO). Given that $F_1 = 600$ N, $F_2 = 900$ N and $M = 9$ kN.m, then the resultant moment about point O is: (4 Marks)

- (a) -5.76 kN.m (b) 4.68 kN.m (c) 2.88 kN (d) -2.88 k (e) -4.68 kN.m (h) -----

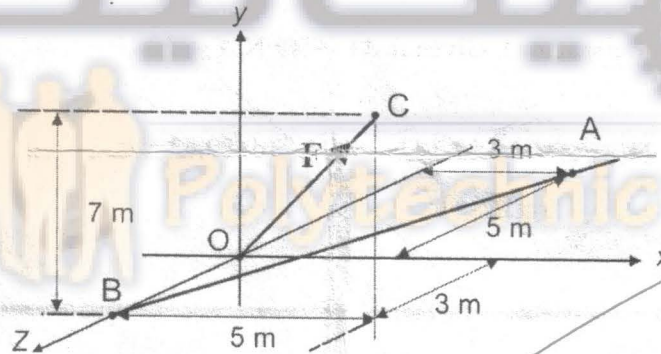
لجنة الميكانيك - الإتجاه الإسلامي

Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering		اسم الطالب :
رقم الطالب :		مدرس الشعبة :
وقت المحاضرات : ١٣-١٤ ٢ ٥ ٩		د. عيد سهاونة



Q4- Force F has a magnitude = 16 kN. The moment of F about point B is:

- (a) 32.05 kN.m (b) 93.72 kN.m (c) 39 kN.m
(d) 64 kN.m (e) 46.36 kN.m (h) -----



Q5- Force F has a magnitude of 5 kN. The magnitude of the moment of force F about the axis AB is:

- (a) -8.1 kN.m (b) -0.847 kN (c) -4.05 kN.m
(d) -1.775 kN.m (e) -3.88 kN.m (h) -----

لجنة الميكانيك - الإتجاه الإسلامي

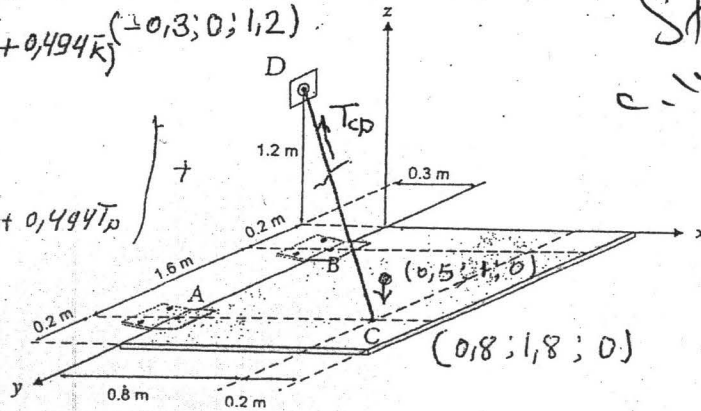
Al-Balqa Applied University Faculty of Engineering Department of Road and Bridge Engineering	رقم الطالب :	اسم الطالب :
	وقت المحاضرات :	مدرس الشعبة :

$\bar{W} = -200\bar{k}$
 $\bar{T}_{CD} = T_{CD} \cdot \frac{-1,1\bar{i} - 1,8\bar{j} + 1,2\bar{k}}{\sqrt{1,1^2 + 1,8^2 + 1,2^2}}$

$\bar{T}_{CD} = (-0,453\bar{i} - 0,741\bar{j} + 0,494\bar{k})$

$M_y = \begin{vmatrix} 0 & 1 & 0 \\ 0,8 & 1,8 & 0 \\ -0,453T_D & -0,741T_D & 0,494T_D \end{vmatrix} +$

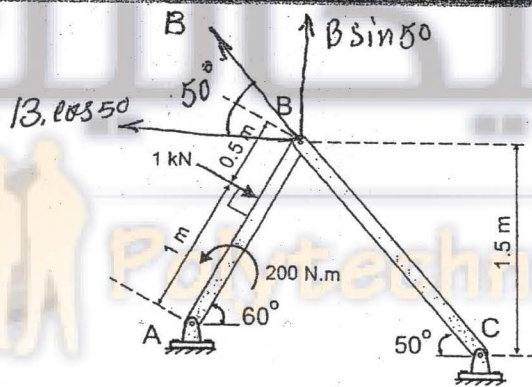
$+ \begin{vmatrix} 0 & 1 & 0 \\ 0,5 & 1 & 0 \\ 0 & 0 & -200 \end{vmatrix} = 0$



عسر
Static
عسر

Q3- The door shown is supported by a cable between points C and D, and two hinge supports fitted at points A and B. Given that the door has a weight of 200 N, determine the force in the cable. Assume the door has a constant thickness.

T_{CD} is: 253,036 N (6 marks)



Q4- The above frame is pin-jointed at B and it is supported by two hinge supports at A and C. The frame is subjected to the shown force and couple moment. Determine the horizontal and vertical components of the internal force at pin B. Ignore the weights of members AB and BC.

B_x : 364,9 N B_y : 434,8 N (6 marks)

$\sum M_A = 0 \curvearrowright$

$B \cdot \cos 50 \cdot (1,5 \sin 60) + B \sin 50 \cdot (1,5 \cos 60) - 1000 \cdot 1 + 200 = 0$

$0,835B + 0,574B - 800 = 0$

$1,409B - 800 = 0$

$B = 567,7 N$

$B_x = 364,9 N$

$B_y = 434,8 N$

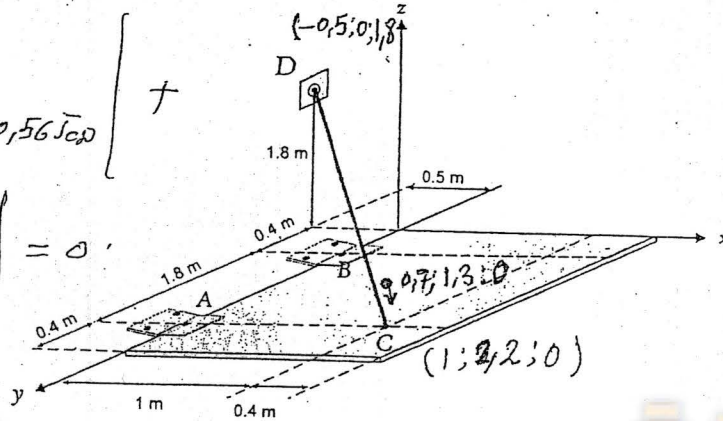
لجنة الميكانيك - الإتجاه الإسلامي

Al-Balqa' Applied University Faculty of Engineering Department of Road and Bridge Engineering	رقم الطالب :	اسم الطالب :
	وقت المحاضرات :	مدرس الشعبة :

$$W = -350 \bar{k}$$

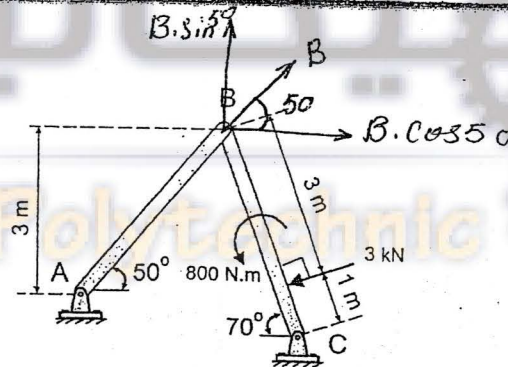
$$\bar{T}_{CD} = T_{CD} \cdot \frac{(-1,5\bar{i} - 2,2\bar{j} + 1,8\bar{k})}{\sqrt{(1,5^2 + 2,2^2 + 1,8^2)}} = -0,466T_{CD}\bar{i} - 0,684T_{CD}\bar{j} + 0,56T_{CD}\bar{k}$$

$$M_y = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 2,2 & 0 \\ -0,466T_{CD} & -0,684T_{CD} & 0,56T_{CD} \end{pmatrix} + \begin{pmatrix} 0 & 1 & 0 \\ 0,7 & 1,3 & 0 \\ 0 & 0 & -350 \end{pmatrix} = 0$$



Q3- The door shown is supported by a cable between points C and D, and two hinge supports fitted at points A and B. Given that the door has a weight of 350 N, determine the force in the cable. Assume the door has a constant thickness.

T_{CD} is: **437,5 N** (6 marks)



Q4- The above frame is pin-jointed at B and it is supported by two hinge supports at A and C. The frame is subjected to the shown force and couple moment. Determine the horizontal and vertical components of the internal force at pin B. Ignore the weights of members AB and BC.

B_x : **705,9 N** B_y : **841,1 N** (6 marks)

$$\sum M_C = 0 \quad \curvearrowright$$

$$-B \cdot \cos 50 \cdot (4 \cdot \sin 70) - B \cdot \sin 50 (4 \cos 70) + 800 + 3000 \cdot 1 = 0$$


$$-2,416B - 1,048B + 3800 = 0$$

$$B = 1,098 \text{ kN}$$

$$B_x = 705,9 \text{ N}$$

$$B_y = 841,1 \text{ N}$$

لجنة الميكانيك - الإتجاه الإسلامي

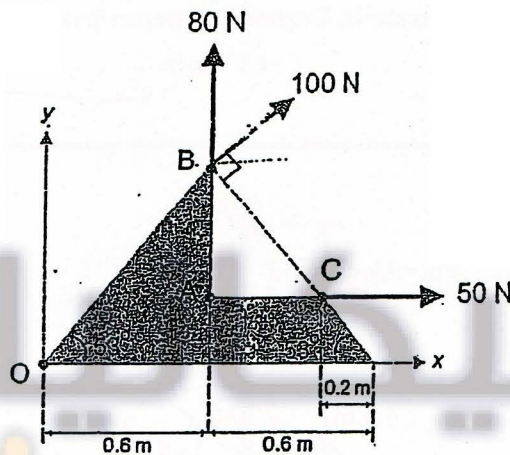
Al-Balqa' Applied University Faculty of Engineering Department of Mechanical and Bridge Engineering	
رقم الطالب :	إسم الطالب :
وقت المحاضرات :	مدرس الشعبة :

Statics

Instructions:

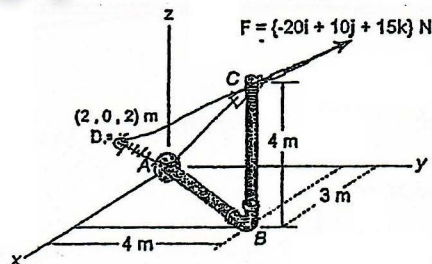
First Exam – 19th November 2009

1. Write your name, number, lecturer's name and lectures' times on all pages.
2. Write your final answers in the empty spaces on the exam paper.
3. Any answers not in the specified empty spaces, will get zero mark.
4. Show your calculations on the writing sheets provided, any final answers with no calculations will get zero mark.



Q 1- For the system of forces that act on the body above, calculate the following: (8 Marks)

- (A) The magnitude of the resultant force
- (B) The direction of the resultant force
- (C) The moment of the system about point O



Q 2- The pipe assembly is subjected to force F as shown. Determine the following: (12 Marks)

- (A) The magnitude of the moment about the x axis (M_{Ax})
- (B) The moment produced by F about point A, has the following coordinate direction angles:
 α β γ
- (C) The magnitude of the moment about point D (M_D)
- (D) The magnitude of the moment about the AB axis (M_{AB}).....