## Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FORCE VECTORS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parallelogram law</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Addition of a system of coplanar forces</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Addition of Cartesian vectors</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Cartesian position and force vectors</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Dot product</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>EQUILIBRIUM OF A PARTICLE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Particle equilibrium in two dimensions</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>FORCE SYSTEM RESULTANTS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cross product and moment of a force</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Transmissibility of a force, principles of moments</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Moment of a force about a specified axis</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Moment of a couple</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Resultants of a force &amp; couple system</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Further reduction of a force/couple system</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Reduction of a simple distributed loading</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>EQUILIBRIUM OF A RIGID BODY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equilibrium of a rigid body in 2D</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Two and three-force members</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>KEY TO QUESTIONS</td>
<td>20</td>
</tr>
</tbody>
</table>
Chapter 1

Force Vectors

Parallelogram Law

1) Two forces are to be added to determine the resultant force \( F_r \).
   Compute the angle \( \theta \)

\[ \theta = ? \]

- 120
- 140
- 160
- None of the above

2) Two forces are to be added to determine the resultant force \( F_r \).
   Compute the angle \( \theta \)

\[ \theta = ? \]

- 30
- 45
- 60
- None of the above

3) To determine \( F_r \) shown in the figure, do you use:

- Cosine Law
- Sine Law
- Pythagorean theorem
- None of the above

4) To determine \( F_r \) shown in the figure, do you use:

- Cosine Law
- Sine Law
- Pythagorean theorem
- None of the above

5) To determine \( F_r \) shown in the figure, do you use:

- Cosine Law
- Sine Law
- None of the above
Addition of a System of Coplanar Forces

1) Select the answer that expresses \( F \) as a Cartesian Vector.

\[ F = 100\text{i N} \]

2) Select the answer that expresses \( F \) as a Cartesian Vector.

\[ F = 100\text{j N} \]

3) Select the answer that expresses \( F \) as a Cartesian Vector.

\[ F = \begin{pmatrix} -70.7 \text{i} + 70.7 \text{j} \end{pmatrix} \text{ N} \]

4) Select the answer that expresses \( F \) as a Cartesian Vector.

\[ F = \begin{pmatrix} 60 \text{i} + 80 \text{j} \end{pmatrix} \text{ N} \]

5) Calculate the magnitude of \( F_x \).

\[ F_x = 25 \text{ N} \]

6) cont....From qu5, select the equation which is used to determine the direction \( \theta \) measured counterclockwise from the +x axis.

\[ \theta = \arctan \left( \frac{-300}{400} \right) \]

Addition of Cartesian Vectors

1) Calculate the magnitude of the force. \( F = (30\text{i} - 40\text{j}) \text{ N} \).

\[ F = \begin{pmatrix} 25 \text{i} - 40 \text{j} \end{pmatrix} \text{ N} \]

5) Calculate the magnitude of \( F_x \).
2) Calculate the magnitude of the force. 
\[ F = (10i + 20j - 20k) \text{ N} \]
\[ F = ? \]
- 25 N
- 30 N
- 40 N
- None of the above

3) If \( F = (40i - 30j) \text{ N} \), select the answer that specifies the \( \cos \beta \).
\[ \cos \beta = ? \]
- -0.6
- -0.8
- 0.6
- None of the above

4) If \( F = (-100i + 200j - 200k) \text{ N} \), select the answer that specifies the \( \cos \beta \).
\[ \cos \beta = ? \]
- -0.667
- 0.667
- 0.333
- -0.333
- None of the above

5) Select the answer that gives the \( y \) component for the 100-N force.
\[ F_y = ? \]
- \( 100\sin 45\sin 60 \)
- \( 100\sin 45\cos 60 \)
- \( 100\cos 45\cos 60 \)
- \( 100\cos 45/\sin 60 \)
- None of the above

6) Select the answer that gives the \( y \) component for the 100-N force.
\[ F_y = ? \]
- \( 100\sin 60 \cdot 4/5 \)
- \( 100\sin 60 \cdot 3/5 \)
- \( 100\cos 60 \cdot 3/5 \)
- None of the above

Cartesian Position and Force Vectors

1) Select the answer that represents the position vector \( r \).
4) Select the answer that specifies the $\cos \gamma$.
- $0.667$
- $-0.667$
- $0.333$
- $-0.333$
- None of the above

5) Select the answer that specifies the $\cos \gamma$.
- $0.667$
- $-0.667$
- $0.333$
- $-0.333$
- None of the above

6) If $r$ has a magnitude of 10 m and acts in a direction defined by the unit vector $u = -0.707i + 0.707j$, calculate the angle that $r$ makes with the positive x-axis. Answer = ?
- 45
- 180
- 135
- 225
- None of the above

7) If $r$ has a magnitude of 10 m calculate $\gamma$.

8) Select the answer that expresses $r$ as a Cartesian Vector.
- $(5i - 5j - 7.07k) m$
- $(-5i - 7.07j - 5k) m$
- $(5i + 5j + 7.07k) m$
- $(5i + 7.07j + 5k) m$
- None of the above

9) Select the answer that represents the force vector $F$ directed from A towards B.
Dot Product

1) Calculate the dot product.
\((3i).(-4i) = ?\)

- 6
- -6
- -12

- 0

- None of the above

2) Calculate the dot product.
\((1i + 2j + 3k).(1i - 3j - 1k) = ?\)

- 3
- -5
- -8

- -10
- None of the above

3) Calculate the angle between \(r_1\) and \(r_2\).
\(\theta = ?\)

- 30
- 45
- 60

- None of the above

4) If \(F = (30i + 20j) \text{ N}\) and a line is defined by \(u = (-0.8i - 0.6j)\), calculate \(F.u\).
\(F.u = ?\)

- -12
- -34
- -70

- None of the above

5) Calculate the magnitude of the projection of \(F\) along the line \(OA\).
\(\text{Proj } F = ?\)

- 16
- 18
- 34

- None of the above

6) Calculate the magnitude of the projection of \(F\) along the line \(OA\).
\(\text{Proj } F = ?\)

- 0
- 20
- 40
- 80

- None of the above

---

\[ \mathbf{F} = ? \]

- \((300i + 300j - 200k)\)
- \((200i + 200j - 100k)\)
- \((200i + 100j - 200k)\)
- \((-200i + 200j - 100k)\)

- None of the above

\[ \mathbf{F} = (20i + 20j + 30k) \text{ N} \]

\[ \theta = ? \]

- 30
- 45
- 60

- None of the above
Chapter 2

Equilibrium of a Particle

Particle
Equilibrium in Two Dimensions

1) The unstretched length of the elastic cord AB is 3 m. Determine the force in the stretched cord if the cord stiffness is \( k = 400 \) N/m.

\[ F = ? \]

- 400 N
- 750 N
- 800 N
- 1200 N
- 2000 N
- None of the above

2) Calculate the force \( F \) required for the equilibrium of the particle.

\[ F = ? \]

- -60 N
- -20 N
- 40 N
- None of the above

3) Select the equation that represents the application of force equilibrium in the \( x \) direction.

- \( P\sin45 - F\cos45 + 100\cos30 = 0 \)
- \( P\cos45 - F\cos45 + 100 = 0 \)
- None of the above

4) Select the equation that represents the equation of force equilibrium in the \( x \) direction.

- \( P\cos45 - F\cos45 + 100\cos30 = 0 \)
- \( -P\cos45 + F\cos75 + 100\cos30 = 0 \)
- None of the above

5) The force of 100 N acts at point A. Draw the free-body diagram of point A and calculate the force developed in cable AC.

\[ 100\cos30 + F\cos75 - P\cos15 = 0 \]

- None of the above
6) Calculate the stretch in the elastic cable BA if the system is held in the equilibrium position shown. Both AB and AC are elastic cables.

\[ F_{AC} = ? \]
- 70.71 N
- 100 N
- 141.42 N
- None of the above

\[ \text{Stretch in BA = ?} \]
- 1 m
- 1.5 m
- 2 m
- None of the above
Chapter 3

Force System Resultants

Cross Product and Moment of a Force

1) Select the answer that represents the result of the vector cross product.
   \( i \times k = ? \)
   - \( j \)
   - \(-i\)
   - \(-j\)
   - 0
   - None of the above

2) Select the answer that represents the result of the vector cross product.
   \( 2k \times 6k = ? \)
   - \(12i\)
   - 0
   - \(12j\)
   - \(12k\)
   - None of the above

3) Select the answer that represents the moment of the force about point 0.
   \( M_0 = ? \)

4) Select the answer that represents the moment of the 100N force about point O.
   \( M_0 = ? \)
   - 200 Nm clockwise
   - 400 Nm clockwise
   - 0
   - 200 Nm anticlockwise
   - None of the above

5) Select the answer that represents the moment of the 100N force about point O.
   \( M_0 = ? \)
   - 200 Nm counterclockwise
   - 200 Nm clockwise
   - 0
   - None of the above

6) Use the vector cross product and compute the moment of the 100-N force about point O.
   \( M_0 = ? \)
   - (70.7 k) Nm
   - (141.4 k) Nm
   - (-141.4 k) Nm
   - (-70.7 k) Nm
   - None of the above
7) Calculate the moment of the force about point O using the vector cross product and select the correct answer. 
\[ M_O = ? \]

- (20i - 30k) Nm
- (60i - 30k) Nm
- (60i - 30j) Nm
- (60i + 40j - 30k) Nm
- None of the above

**Transmissibility of a Force about a Specified System**

1) Select the answer that represents the moment of the force about point O. 
\[ M_O = ? \]

- 200 Nm clockwise
- 200 Nm counterclockwise
- 300 Nm clockwise
- 0 Nm
- None of the above

2) Calculate the resultant moment about point O. 
\[ M_O = ? \]

- 500 Nm clockwise
- 100 Nm clockwise
- 100 Nm counterclockwise
- 500 Nm counterclockwise
- None of the above

3) Calculate the resultant moment about point O. 
\[ M_O = ? \]

- 75 Nm clockwise
- 150 Nm clockwise
- 200 Nm clockwise
- 600 Nm counterclockwise
- None of the above

4) Calculate the resultant moment about point O. 
\[ M_O = ? \]

- 200 Nm clockwise
- 200 Nm counterclockwise
- 300 Nm clockwise
- 0 Nm
- None of the above

5) Calculate the resultant moment about point O. 
\[ M_O = ? \]

- 100 Nm counterclockwise
- 100 Nm clockwise
- 173.2 Nm counterclockwise
- 200 Nm clockwise
- None of the above

6) Calculate the resultant moment about point O. 
\[ M_O = ? \]

- 0
- 50 Nm clockwise
- 40 Nm clockwise
- 200 Nm clockwise
Moment of a Force About a Specified Axis

1) For questions 1 to 3, select the answer that represents the moment of the 100 N force about each of the coordinate axes. $M_x = ?$

- $-300$ Nm
- $-200$ Nm
- $200$ Nm
- $300$ Nm
- None of the above

2) cont.... $M_y = ?$

- $-200$ Nm
- $-300$ Nm
- $0$
- $200$ Nm
- None of the above

3) cont.... $M_z = ?$

- $300$ Nm
- $0$ Nm
- $-200$ Nm
- $-300$ Nm
- None of the above

4) For questions 4 to 6, select the answer that represents the moment of the 100 N force about each of the coordinate axes. $M_x = ?$

- $-300$ Nm
- $-200$ Nm
- $200$ Nm
- $300$ Nm
- None of the above

5) cont.... $M_y = ?$

- $0$
- $50$ Nm
- $100$ Nm
- $200$ Nm
- None of the above

6) cont.... $M_z = ?$

- $0$ Nm
- $200$ Nm
- $50$ Nm
- $-200$ Nm
- None of the above

7) Select the answer that represents the moment of F about the x-axis. Use a Cartesian vector analysis and define the unit vector for the axis as $u = i$. $M_x = ?$

- $6$ Nm
- $-6$ Nm
- $4$ Nm
- $-4$ Nm
- None of the above

8) Select the possible position vectors $r$ that can be used in the formulation $M_a = u(r \times F)$.

- $r$ from A to B, B to D
- $r$ from A to D, B to C
- $r$ from A to C, A to B
- None of the above

9) The moment of F is to be determined about the OA axis. Select the terms that are in the second column of the
**Moment of a Couple**

1) Determine the couple moment by computing the moment of the couple's two forces about point A. \( M_c = ? \)

- 100 Nm (clockwise)
- 200 Nm (clockwise)
- 250 Nm (clockwise)
- 300 Nm (clockwise)
- None of the above

2) Determine the couple moment by computing the moment of the couple's two forces about point A. \( M_c = ? \)

- 100 Nm (clockwise)
- 200 Nm (clockwise)
- 250 Nm (clockwise)
- 300 Nm (clockwise)
- None of the above

3) Compute the magnitude \( F \) for each of the two forces acting on the outer circle, so that they create the same couple moment as that created by the 100-N forces acting on the inner circle. \( F = ? \)

- 10 N
- 25 N
- 40 N
- 80 N
- None of the above

4) Calculate the magnitude of the resultant couple moment of the two couples acting on the bar. \( M_c = ? \)

- 30j Nm
- 40j Nm
- 50j Nm
- 100j Nm
- None of the above

5) Calculate the moment of the couple using \( M_c = r_{AC}F \) and \( M_c = r_{AB}F \).

- 75 Nm (clockwise)
- 25 Nm (clockwise)
- 100 Nm (clockwise)
- 175 Nm (clockwise)
- None of the above

6) Select the answer that represents the magnitude of the resultant couple moment acting on the block.

- 30j Nm
- 40j Nm
- 50j Nm
- 100j Nm
- None of the above
Resultants of a Force and Couple System

1) Select the answer that represents the equivalent force and couple-moment system acting at A.

- 100 N (right), 20 Nm clockwise
- 100 N (right), 0
- 100 N (left), 0
- 100 N (right), 20 Nm counterclockwise
- None of the above

2) Select the answer that represents the equivalent force and couple-moment system acting at A.

- (-100i)N, (100k)Nm
- (100i)N, (-100k)Nm
- (100j)N, (100k)Nm
- None of the above

3) The loading is to be replaced by an equivalent force and couple-moment system acting at A. For questions 3 to 5, calculate the resultants. $F_x = ?$

- 0 N
- 75 N (right)
- 100 N (right)
- 100 N (left)
- None of the above

4) cont....From question 3, $F_y = ?$

- 0
- 100 down
- 100 up

5) cont....From question 3, $M_{RA} = ?$

- 50 Nm Clockwise
- 250 Nm Clockwise
- 350 Nm Clockwise
- 150 Nm Clockwise
- None of the above

6) The loading is to be replaced by an equivalent force and couple-moment system acting at A. For questions 6 to 8, calculate the resultants. $F_x = ?$

- 0 N
- 80 N (right)
- 100 N (right)
- 60 N (right)
- None of the above

7) cont....From question 6, $F_y = ?$

- 50 N (up)
- 60 N (up)
- 80 N (up)
- 100 (up)
8) cont....From question 6, $M_{RA} = ?$
- 20 Nm counterclockwise
- 120 Nm counterclockwise
- 140 Nm counterclockwise
- 200 Nm counterclockwise
- None of the above

9) The 100-N force is to be replaced by an equivalent force and couple-moment system at O. For questions 9 to 11, calculate these resultant components. Assume positive components act along the positive x, y, z axes.

10) cont....From question 9, $M_{Rx} = ?$
- 100 Nm
- -100 Nm
- 200 Nm
- -200 Nm
- None of the above

11) cont....From question 9, $M_{Ry} = ?$
- 0 Nm
- -50 Nm
- -100 Nm
- -200 Nm
- None of the above

12) cont....From question 9, $M_{Rz} = ?$
- 0 Nm
- -50 Nm
- -100 Nm
- -200 Nm
- None of the above

13) The 100-N force is to be replaced by an equivalent force and couple-moment system at O. For questions 13 to 16, calculate these resultant components. Assume positive components act along the positive x, y, z axes.

14) cont....From question 13, $M_{Rx} = ?$
- 100 Nm
- -100 Nm
- -200 Nm
- 200 Nm
- None of the above

15) cont....From question 13, $M_{Ry} = ?$
- -200 Nm
- 200 Nm
- 300 Nm
- -300 Nm
- None of the above

16) cont....From question 13, $M_{Rz} = ?$
- 0 Nm
- -50 Nm
- 100 Nm
- -200 Nm
- None of the above

17) The force system is to be replaced by an equivalent force and couple-moment system at O. For questions 17 to 22, calculate these resultant components. Assume positive components act along the positive x, y, z axes.
18) cont....From question 17, $F_{R_y} =$ ?
-100 N  
100 N  
200 N  
0 N  
None of the above

19) cont....From question 17, $F_{R_z} =$ ?
0 N  
100 N  
-100 N  
200 N  
None of the above

Further Reduction of a Force and Couple System

1) Apply the equation $F_r(x) = \sum M_o$ in order to determine the position $x$ of the resultant force on the member. Assume moments are positive in the $+z$ direction, i.e. Clockwise $x = ?$

2) For questions 2, 3 and 4, calculate the $x$ and $y$ components of an equivalent single resultant force and specify its location on the member, measured from point O. Assume positive components act along the positive $x$ and $y$ axes.

3) cont....From question 2, $F_{R_y} =$ ?
0 N  
100 N  
-100 N  
300 N  
None of the above

4) cont....From question 2, $x =$ ?
-1 m  
1 m  
-2 m  
2 m  
None of the above

5) For questions 5, 6 and 7, calculate the $x$ and $y$ components of an equivalent single resultant force and specify its location on the member, measured from point O. Assume positive components act along the positive $x$ and $y$ axes.

6) cont....From question 5, $F_{R_y} =$ ?
0 N  
50 m  
+100 N  
-100 N  
None of the above

7) cont....From question 5, $x =$ ?
8) For questions 8, 9 and 10, calculate the x and y components of an equivalent single resultant force and specify its location on the member, measured from point O. Assume positive components act along the positive x and y axes.

\[ F_{rx} = ? \]

-60 N  
-80 N  
-150 N  
280 N  
None of the above

9) cont....From question 8, \( F_{ry} = ? \)

-40  
-60  
-80 N  
-180 N  
None of the above

10) cont....From question 8, \( x = ? \)

-1 m  
2 m  
-4 m  
-8 m  
None of the above

11) For questions 11 to 13, calculate the equivalent single resultant force and specify its x and y coordinates. \( F_{rx} = ? \)

\[ 100 \text{ N (down)} \]
\[ 200 \text{ N (down)} \]
\[ 400 \text{ N (down)} \]
None of the above

12) cont....From question 11, \( x = ? \)

0.5 m  
1 m  
1.5 m  
2 m  
None of the above

13) cont....From question 11, \( y = ? \)

0.5 m  
1 m  
1.5 m  
2 m  
None of the above

14) For questions 14 to 16, calculate the equivalent single resultant force and specify its x and y coordinates. \( F_{rz} = ? \)

\[ 200 \text{ N (down)} \]
\[ 200 \text{ N (up)} \]
0 N  
None of the above

15) cont....From question 14, \( x = ? \)

0 m  
1 m  
2 m  
4 m  
None of the above

16) cont....From question 14, \( y = ? \)

0 m  
1 m  
2 m  
4 m  
None of the above

Reduction of a Simple
Distributed Loading

1) For the next 2 questions, calculate the resultant force \( F_r \) of the distributed loading and specify its location \( d \) measured from point \( O \).

\[ F_r = ? \]

\[ 0 \text{ m} \]
\[ 1 \text{ m} \]
\[ 1.5 \text{ m} \]
\[ None \text{ of the above} \]

2) cont....

\[ d = ? \]

\[ 0 \text{ m} \]
\[ 1 \text{ m} \]
\[ 2 \text{ m} \]
\[ None \text{ of the above} \]

3) For the next 2 questions, calculate the resultant force \( F_r \) of the distributed loading and specify its location \( d \) measured from point \( O \).

\[ F_r = ? \]

\[ 100 \text{ N} \]
\[ 150 \text{ N} \]
\[ 200 \text{ N} \]
\[ None \text{ of the above} \]

4) cont....

\[ d = ? \]

\[ 0 \text{ m} \]
\[ 0.5 \text{ m} \]
\[ 1 \text{ m} \]
\[ None \text{ of the above} \]

5) For the next three questions, calculate the resultant force \( F_r \) of the distributed load acting on the surface of the plate and specify its \( x \) and \( y \) coordinates measured from point \( O \).

\[ F_r = ? \]

\[ 100 \text{ N} \]
\[ 150 \text{ N} \]
\[ 200 \text{ N} \]
\[ 300 \text{ N} \]
\[ None \text{ of the above} \]

6) cont....

\[ x = ? \]

\[ 0 \text{ m} \]
\[ 0.5 \text{ m} \]
\[ None \text{ of the above} \]

7) cont....

\[ y = ? \]

\[ 0.5 \text{ m} \]
\[ 1 \text{ m} \]
\[ None \text{ of the above} \]

8) For the next 2 questions, use integration to calculate the resultant force \( F_r \) of the distributed load and specify its location \( d \) measured from point \( O \). Select the answer from the list.

\[ F_r = ? \]

\[ 25 \text{ N} \]
\[ 50 \text{ N} \]
\[ 60 \text{ N} \]
\[ 66.7 \text{ N} \]
\[ None \text{ of the above} \]

9) cont....

\[ d = ? \]

\[ 0.5 \text{ m} \]
\[ 0.667 \text{ m} \]
\[ None \text{ of the above} \]
0.75 m

0.8 m

None of the above
Chapter 4

Equilibrium of Rigid Body

Equilibrium of a Rigid Body in 2D

1) On a sheet of paper draw the free-body diagram of member AB then list the number of unknowns. Number of unknowns = ?

2) On a sheet of paper draw the free-body diagram of member AB then list the number of unknowns. Number of unknowns = ?

3) On a sheet of paper draw the free-body diagram of member AB then list the number of unknowns. Number of unknowns = ?

4) On a sheet of paper draw the free-body diagram of member AB then list the number of unknowns. Number of unknowns = ?

5) On a sheet of paper draw the free-body diagram of member AB then list the number of unknowns. Number of unknowns = ?
6) The free-body diagram is shown in the figure. Select the equation that represents the moment equilibrium equation about point A. Assume positive moments are clockwise.

- $F \cos 45^\circ (2m) + F \sin 45^\circ (2m) - 600N(6m) = 0$
- $F \cos 45^\circ (2m) - F \sin 45^\circ (2m) - 600N(6m) = 0$
- $-600N(6m) - F \cos 45^\circ (2m) - F \sin 45^\circ (2m) = 0$
- None of the above

7) The free-body diagram is shown in the figure. Select the equation that represents the moment equilibrium equation about point A. Assume positive moments are clockwise.

- $200N(4\cos 30^\circ m) + F(2m) = 0$
- $200N(4\cos 30^\circ m) - F(2m) = 0$
- $200N(4m) - F \cos 30^\circ m(2m) = 0$
- None of the above

8) The free-body diagram is shown in the figure. Select the equation that represents the moment equilibrium equation about point A. Assume positive moments are counterclockwise.

- $T(3/5)(0.5m) + 100Nm = 0$
- $T(3/5)(0.5m) - T(4/5)(2m) - 100Nm = 0$
- $T(3/5)(0.5m) + T(4/5)(2m) - 100Nm = 0$
- $-T(3/5)(0.5m) + T(4/5)(2m) - 100Nm = 0$
- None of the above

Two and Three-Force Members

1) On a sheet of paper draw the free-body diagram of member BC, then specify the single equation of equilibrium that should be applied to determine the resultant force acting at the ends of the two-force member AB.

- $\sum M_c = 0$
- $\sum M_B = 0$
- $\sum F_x = 0$
- None of the above

2) On a sheet of paper draw the free-body diagram of member BC, then specify the single equation of equilibrium that should be applied to determine the resultant force acting at the ends of the two-force member AB.

- $\sum M_B = 0$
- $\sum F_y = 0$
- $\sum M_c = 0$
- None of the above

3) Is member BC a two-force member?
4) cont....Is it necessary to specify where the 600 Nm couple moment acts on member BC?
- Yes
- No

5) Is this a two-force member?
- Yes
- No
Key to the questions

Chapter 1  Force Vectors

- Parallelogram law

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

- Addition of a system of coplanar forces

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

- Addition of Cartesian vectors

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

- Cartesian position and force vectors

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

- Dot product

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

Chapter 2  Equilibrium of a particle

- Particle equilibrium in two dimensions

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

Chapter 3  Force System Resultants

- Cross product and moment of a force

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

- Transmissibility of a force, principles of moments

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

- Moment of a force about a specified axis

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

- Moment of a couple
### Resultants of a force & couple system

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
</table>

| Q11 | Q12 | Q13 | Q14 | Q15 | Q16 | Q17 | Q18 | Q19 | Q20 |

### Further reduction of a force/couple system

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |

### Reduction of a simple distributed loading

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |

---

### Chapter 4 Equilibrium of a rigid body

#### Equilibrium of a rigid body in 2D

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |

#### Two and three-force members

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |

---

Source: www.lboro.ac.uk