

DATE : December 12, 1994  
Department & Course No : 23.135  
Paper No : 261

PAGE No: 1 of 6  
Time : 6:00 p.m.  
2 HOURS

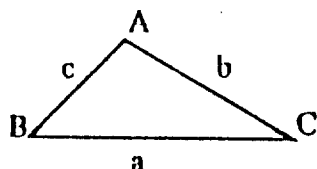
EXAMINATION: Applied Mechanics 1A EXAMINERS : Desai, Domaschuk, McLachlan,  
Polyzois, Rajapakse and Shah

AFFIX UPPER PORTION OF FLAP HERE											
(I UNDERSTAND THAT CHEATING IS A VERY SERIOUS OFFENSE)											
STUDENT SIGNATURE _____	<b>FOR USE OF EXAMINER</b>  CANDIDATE'S MARK <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 10px; text-align: center;">1</td><td style="width: 80px;"></td></tr> <tr><td style="text-align: center;">2</td><td></td></tr> <tr><td style="text-align: center;">3</td><td></td></tr> <tr><td style="text-align: center;">4</td><td></td></tr> <tr><td style="text-align: center;">5</td><td></td></tr> </table>	1		2		3		4		5	
1											
2											
3											
4											
5											
PRINT STUDENT NAME IN FULL _____											
STUDENT NUMBER _____											
EXAMINATION CENTRE _____ SEAT NUMBER _____											
AFFIX LOWER PORTION OF FLAP HERE											
GRADE											

COURSE \_\_\_\_\_ Instructor \_\_\_\_\_  
(Where possible designate as English 120, etc.)

Faculty or School \_\_\_\_\_ Year in Course \_\_\_\_\_  
(Arts, Science, Medicine, etc.) (I, II, III, IV, etc.)

- NOTE:**
- Attempt any FOUR questions out of five.
  - All questions are of equal value.
  - Calculators are permitted.
  - No textbooks or other aids allowed.



$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\mathbf{P} \times \mathbf{Q} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ P_x & P_y & P_z \\ Q_x & Q_y & Q_z \end{vmatrix} = \mathbf{i}(P_y Q_z - P_z Q_y) - \mathbf{j}(P_x Q_z - P_z Q_x) + \mathbf{k}(P_x Q_y - P_y Q_x)$$

$$\mathbf{P} \cdot \mathbf{Q} = PQ \cos \theta = P_x Q_x + P_y Q_y + P_z Q_z$$

$$V = |\mathbf{V}| = \sqrt{V_x^2 + V_y^2 + V_z^2}$$

$$\cos \alpha = \frac{V_x}{V}, \cos \beta = \frac{V_y}{V}, \cos \gamma = \frac{V_z}{V}$$

$$\mathbf{M}_O = \mathbf{r} \times \mathbf{F}$$

$$M_{OL} = \lambda_{OL} \cdot M_O = \begin{vmatrix} \lambda_x & \lambda_y & \lambda_z \\ x & y & z \\ F_x & F_y & F_z \end{vmatrix}$$

DATE : December 12, 1994

Department & Course No : 23.135

Paper No : 261

EXAMINATION: Applied Mechanics 1A

PAGE No: 2 of 6

Time : 6:00 p.m.

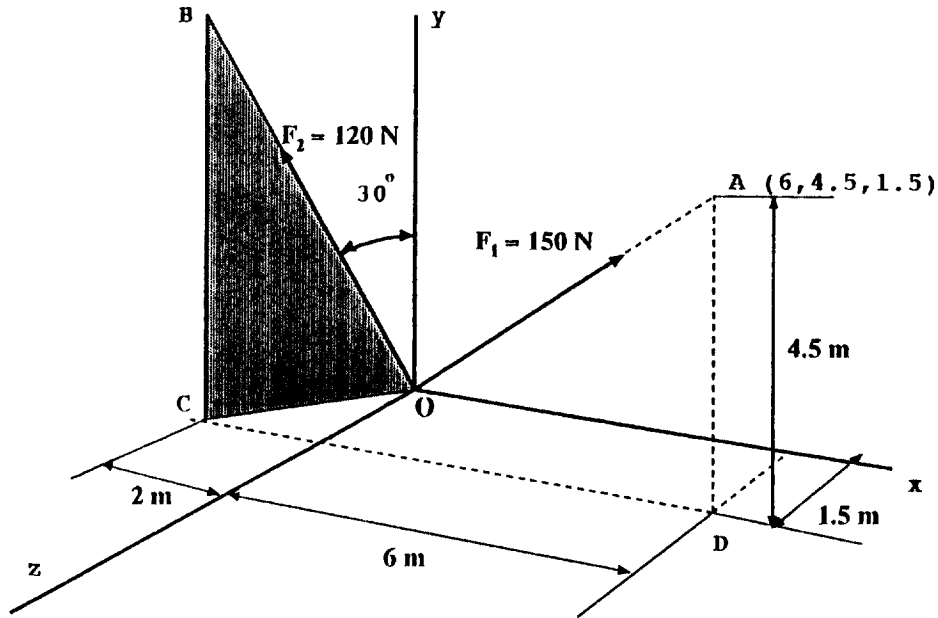
2 HOURS

EXAMINERS : Desai, Domaschuk, McLachlan,  
Polyzois, Rajapakse and Shah

**Question 1:**

A force  $\mathbf{F}_1$  with a magnitude 150 N and a force  $\mathbf{F}_2$  with a magnitude of 120 N are applied in the direction shown in the figure. Note points C and D are in the  $x - z$  plane. Determine :

- the angle between  $\mathbf{F}_1$  and  $\mathbf{F}_2$ .
- the magnitude and direction (angles  $\theta_x, \theta_y$  and  $\theta_z$ ) of the resultant  $\mathbf{R}$  of the two forces.



DATE : December 12, 1994

Department & Course No : 23.135

Paper No : 261

EXAMINATION: Applied Mechanics 1A

PAGE No: 3 of 6

Time : 6:00 p.m.

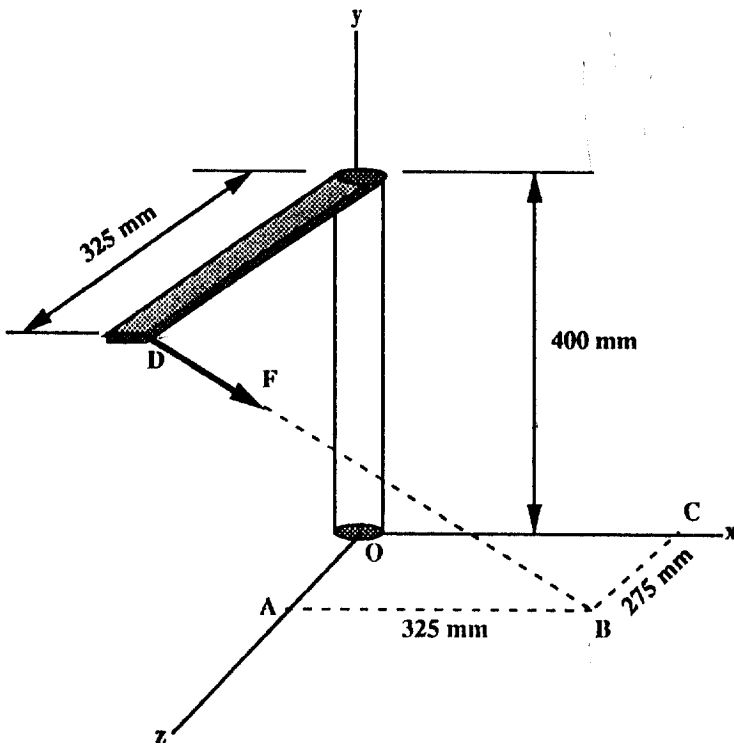
2 HOURS

EXAMINERS : Desai, Domaschuk, McLachlan,  
Polyzois, Rajapakse and Shah

**Question 2:**

A force  $\mathbf{F}$  having magnitude 1000 N is applied to a lever – shaft assembly as shown in the figure. The force  $\mathbf{F}$  is directed from D to B. Points A, B and C lie in the  $x - z$  plane. Point D lies in the  $y - z$  plane.

- Replace the force  $\mathbf{F}$  with an equivalent force-couple system at point A.
- Determine the moment of the force  $\mathbf{F}$  about line AC.



DATE : December 12, 1994

Department & Course No : 23.135

Paper No : 261

EXAMINATION: Applied Mechanics 1A

PAGE No: 4 of 6

Time : 6:00 p.m.

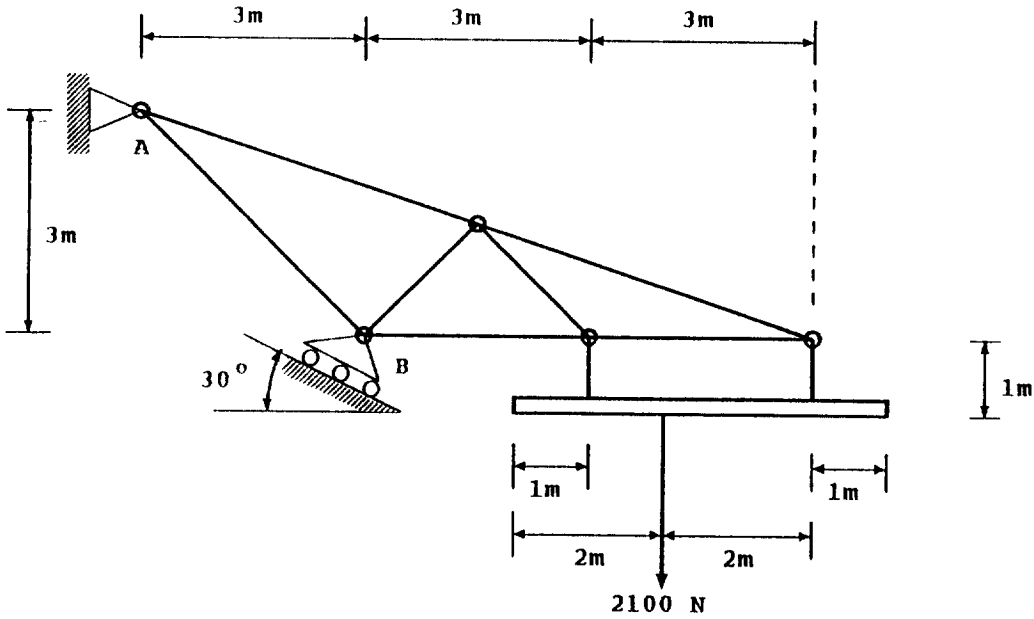
2 HOURS

EXAMINERS : Desai, Domaschuk, McLachlan,

Polyzois, Rajapakse and Shah

**Question 3:**

The planar truss shown in the figure is pin connected at A and is supported on a roller at B. Determine the reactions at A and B.



DATE : December 12, 1994

Department & Course No : 23.135

Paper No : 261

EXAMINATION: Applied Mechanics 1A

PAGE No: 5 of 6

Time : 6:00 p.m.

2 HOURS

EXAMINERS : Desai, Domaschuk, McLachlan,  
Polyzois, Rajapakse and Shah

**Question 4:**

For the system shown in the figure, determine all of the forces acting on member ABC.

