UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINERING TECHNOLOGY

FINAL EXAMINATION
SEPTEMBER 2016 SEMESTER

COURSE CODE	:	LGB 12103
COURSE NAME	:	APPLIED MECHANICS
PROGRAMME NAME	:	BACHELOR OF NAVAL ARCHITECTURE AND SHIP BUILDING
DATE	:	19 JANUARY 2017
TIME	:	09.00 AM – 12.00 PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of TWO (2) sections; Section A and Section B.
4. Answer ALL TWO (2) questions in Section A. For Section B, answer THREE (3) questions ONLY.
5. Please write your answers on answer sheet provided.
6. Answer all questions in English language ONLY.
7. FORMULA has been appended for your reference.

THERE ARE 7 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

(a) The link in Figure 1 is subjected to two forces $\mathbf{F}_1$ and $\mathbf{F}_2$.

i. Determine the resultant force and

(6 marks)

ii. Determine the orientation of the resultant force.

(4 marks)

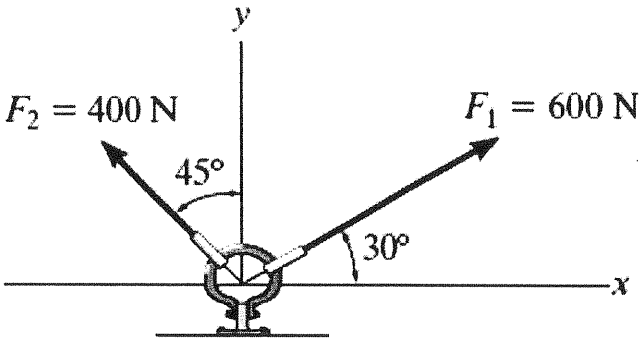


Figure 1

(b) Determine x and y components of $\mathbf{F}_1$ and $\mathbf{F}_2$ acting on the boom. Express each force as a Cartesian vector in Figure 2.

(10 marks)

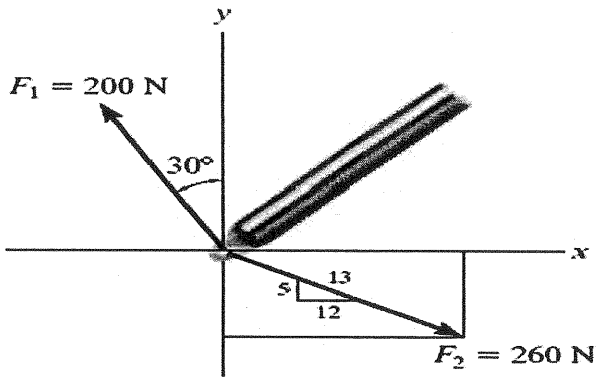


Figure 2

Question 2

(a) The towing pendant AB in Figure 3 is subjected to the force of 50 kN exerted by a tugboat. Determine the force in each of the bridles, BC and BD, if the ship is moving forward with constant velocity.

(10 marks)

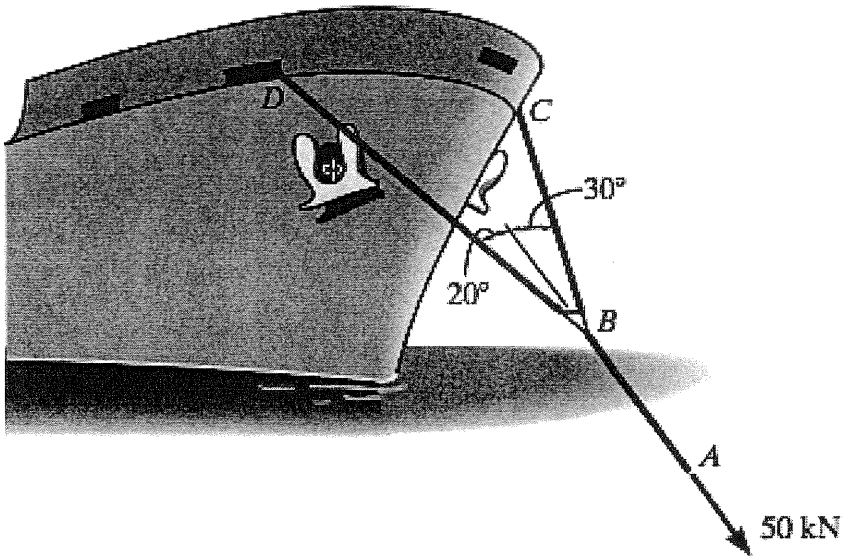


Figure 3

(b) Determine the tension developed in wires CA and CB required for equilibrium of the 10-kg cylinder in Figure 4. Take Θ = 40°

(10 marks)

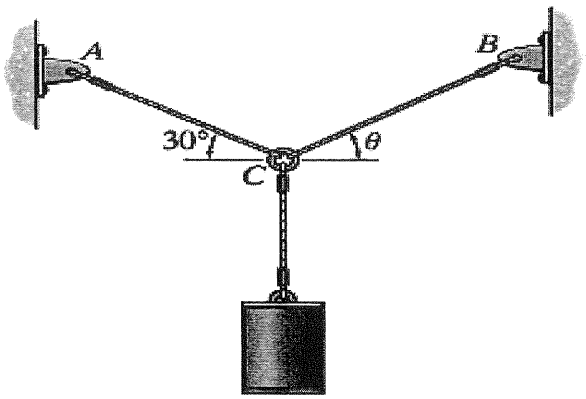


Figure 4

SECTION B (Total: 60 marks)

INSTRUCTION: Answer only THREE (3) questions.
Please use the answer booklet provided.

Question 3

The beams in Figure 5 has a pin connected at end A and roller at end B. Determine the normal force, shear force, and moment at point C.

(20 marks)

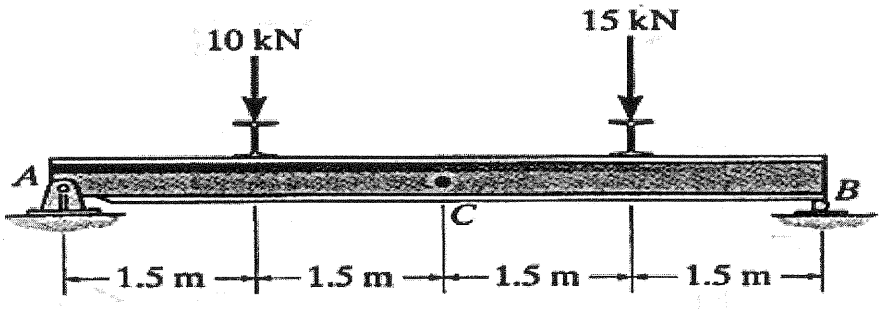


Figure 5

Question 4

(a) Draw the free body- diagram.

(b) Determine the horizontal and vertical components of force reaction (A_y, B_x and B_y) for the beam loaded in Figure 6. Neglect the weight of the beam in the calculations.

(20 marks)

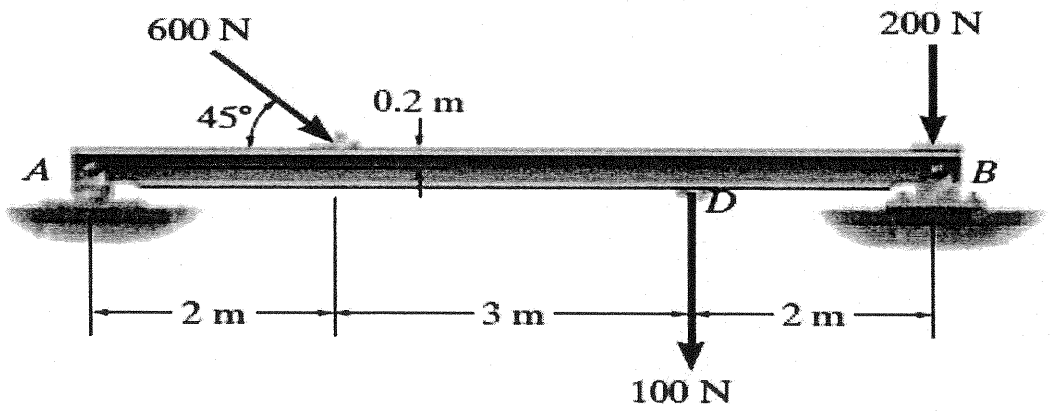


Figure 6

Question 5

Locate the Y centroid of the beam's cross- sectional area in Figure 7.

(20 marks)

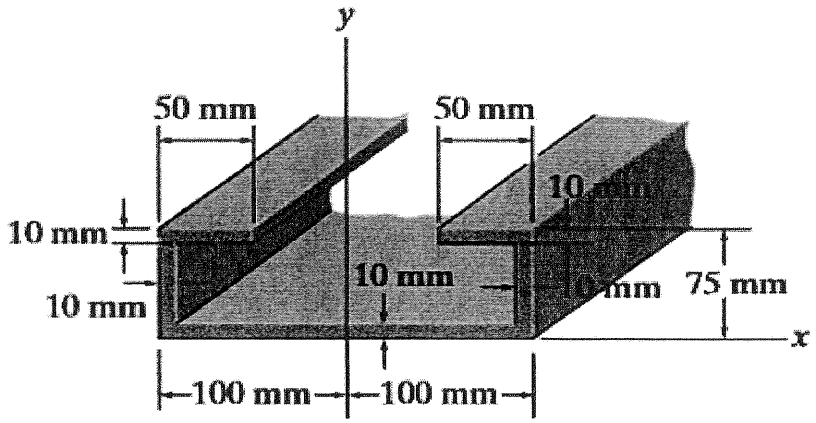


Figure 7

Question 6

Determine the moment of inertia of the composites area about the y' axis in Figure 8.

(20 marks)

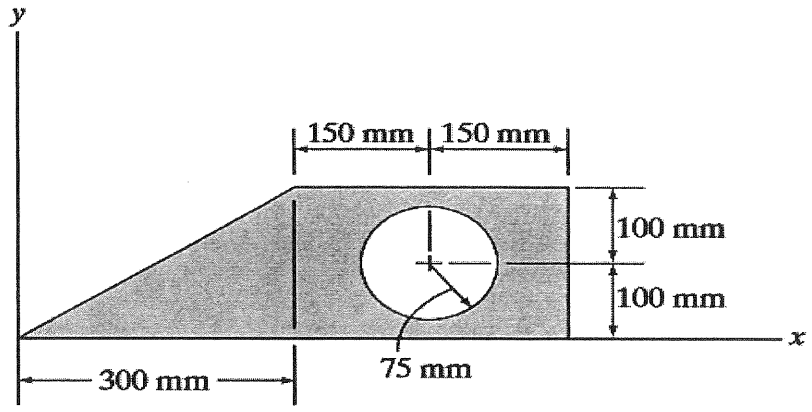


Figure 8

END OF EXAMINATION PAPER

List of formula

$$\bar{x} = \frac{\sum \tilde{x} A}{\sum A}$$

$$\bar{y} = \frac{\sum \tilde{y} A}{\sum A}$$

$I = \sum (I + Ad^2)$

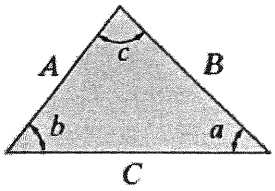
$$k_{x'} = \sqrt{\frac{I_{x'}}{A}}$$

Cosine law:

$$C = \sqrt{A^2 + B^2 - 2AB\cos c}$$

Sine law:

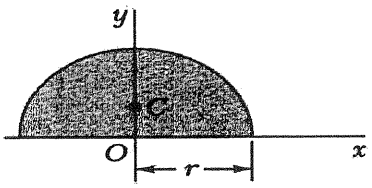
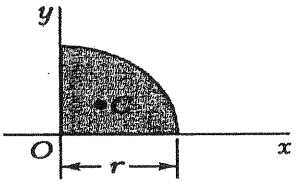
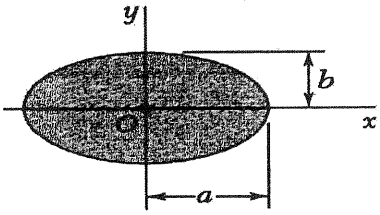
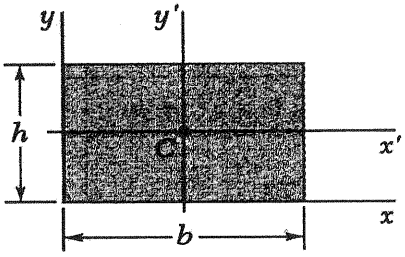
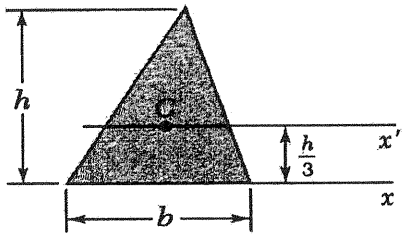
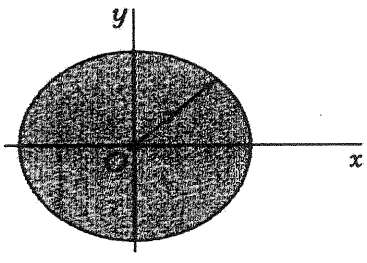
$$\frac{A}{\sin a} = \frac{B}{\sin b} = \frac{C}{\sin c}$$



$$F_{Rx} = \sum F_x$$

$$F_{Ry} = \sum F_y$$

$$F_R = \sqrt{F_{Rx}^2 + F_{Ry}^2} \quad \text{and} \quad \theta = \tan^{-1}\left|\frac{F_{Ry}}{F_{Rx}}\right|$$

Semicircle		$I_x = I_y = \frac{1}{8}\pi r^4$ $J_O = \frac{1}{4}\pi r^4$
Quarter circle		$I_x = I_y = \frac{1}{16}\pi r^4$ $J_O = \frac{1}{8}\pi r^4$
Ellipse		$\overline{I}_x = \frac{1}{4}\pi a b^3$ $\overline{I}_y = \frac{1}{4}\pi a^3 b$ $J_O = \frac{1}{4}\pi ab(a^2 + b^2)$
Rectangle		$\overline{I}_{x'} = \frac{1}{12}bh^3$ $\overline{I}_{y'} = \frac{1}{12}b^3h$ $I_x = \frac{1}{3}bh^3$ $I_y = \frac{1}{3}b^3h$ $J_C = \frac{1}{12}bh(b^2 + h^2)$
Triangle		$\overline{I}_{x'} = \frac{1}{36}bh^3$ $I_x = \frac{1}{12}bh^3$
Circle		$\overline{I}_x = \overline{I}_y = \frac{1}{4}\pi r^4$ $J_O = \frac{1}{2}\pi r^4$