UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2010/2011

COURSE NAME	:	STATIC
COURSE CODE	:	DDA 1013
PROGRAMME	:	1 DDM/ DDT
EXAMINATION DATE	:	NOVEMBER/DECEMBER 2010
DURATION	:	3 HOURS
INSTRUCTIONS	:	ANSWER **ALL** QUESTIONS IN PART A AND **ONE (1)** QUESTION FROM PART B

THIS QUESTION PAPER CONSISTS OF EIGHT (8) PAGES

PART A

Q1 (a) The acceleration a [m/s^2] of a particle is given by the equation

$$a = Ax^3t + Bvt$$

where x, t and v are length [m], time [s] and velocity [m/s] respectively. If the equation is dimensionally homogeneous, give the unit in SI for A and B.

(5 marks)

(b) The pressure p at depth h below the surface of a stationary liquid is given by

$$p = p_s + \gamma h$$

where p_s is the pressure at the surface and γ is a constant.

(i) If p is in newton per meter squared and h is in meters, what are the units of γ?

(ii) The atmospherics pressure is 101.3 kN/m^2 and the pressure at the depth of 10 m below the sea level is 199.4 kN/m^2. Find the value of γ in three significant figures.

(10 marks)

Q2 (a) The plate suspended from two wires is acted on by the three forces shown in Figure Q2(a). Knowing that the resultant acting on the plate is zero, determine the value of **Q** and the angle θ.

(10 marks)

(b) The man exerts a force **P** of magnitude 60 N on the handles of the wheelbarrow as shown in Figure Q2(b). Knowing that the resultant forces **P**, **Q**, and **W** is zero, determine the value of **Q** and **W**.

(10 marks)

Q3 (a) Determine the moment about P if the force **F** and the angle α shown in Figure Q3(a) are 20 N and 30 deg respectively.

(5 marks)

(b) The flex-headed ratchet wrench is subjected to force **P**, applied perpendicular to the handle as shown in Figure Q3(b). Determine the moment M this imparts along the vertical axis of the bolt at A.
Given: **P** =100 Nm, $\theta = 30$ deg, $a = 0.1$ m, $b = 0.01$ m

(15 marks)

Q4 (a) Figure Q4(a) shows 500 kNm of moment *M*, 15kN of force **F**, and 6 kN/m of load w act on a single beam. The length of a and b are 7.5 m and 4.5 m respectively.

(i) Replace the loading by a single resultant force, and
(ii) Specify the location of the force on the beam measured from point *O*.

(10 marks)

(b) Figure Q4(b) shows the distributed loading w(x) act on the bottom of the wing due to the air pressure. If the length a is 3 m and the loading is given as $w(x) = 86x^2$ kN/m,

(i) Determine the equivalent resultant force, and
(ii) Specify where it acts, measured from point *A*.

(10 marks)

PART B

Q5 (a) Locate the centroid of semicircular area as shown in Figure Q5(a).

(10 marks)

(b) Locate the centroid of the shaded area shown in Figure Q5(b)

(15 marks)

Q6 (a) The cylinder shown in Figure Q6(a) has constant density ρ_0. Determine its mass and the position of its center of mass.

(10 marks)

(b) If the cylinder shown in Figure Q6(b) has density given by the equation,

$$\rho = \rho_0\left(1+\frac{x}{L}\right)$$

locate the position of its center of mass.

(15 marks)

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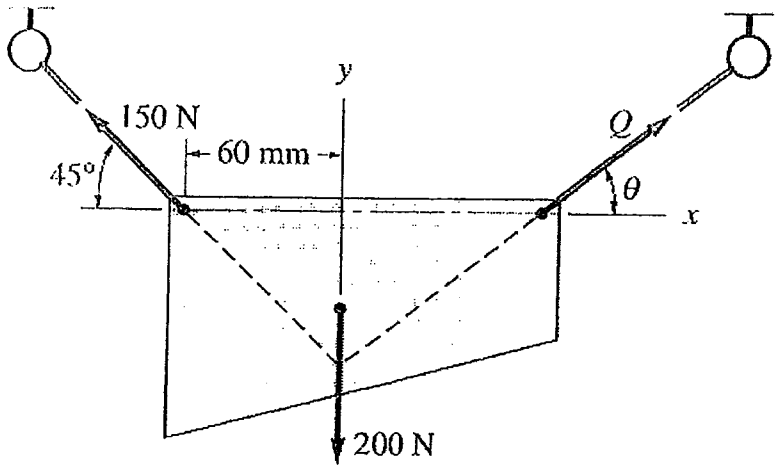

FIGURE Q2(a)

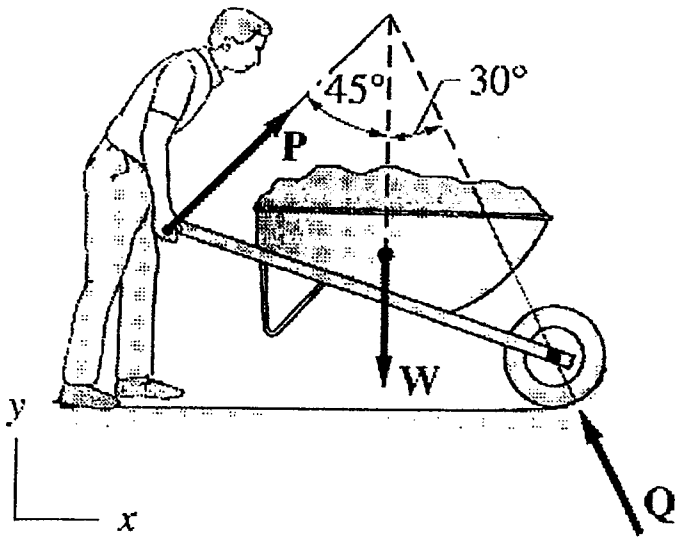

FIGURE Q2(b)

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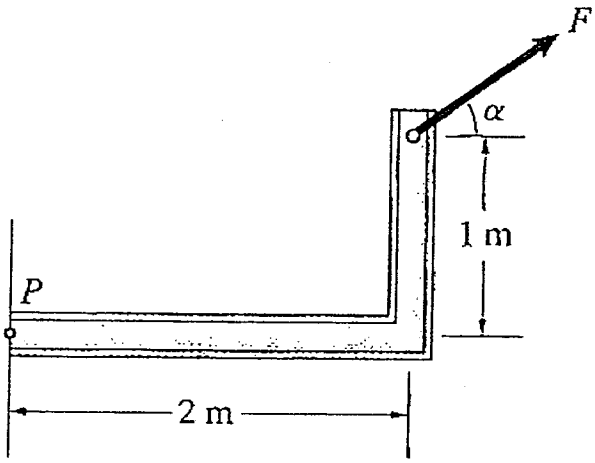

FIGURE Q3(a)

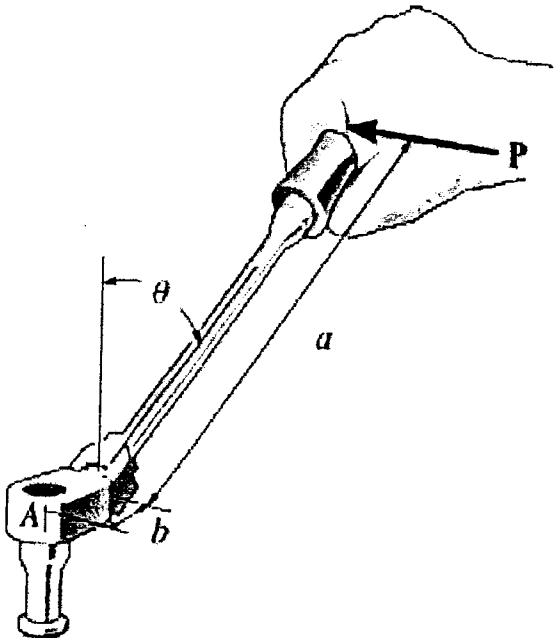

FIGURE Q3(b)

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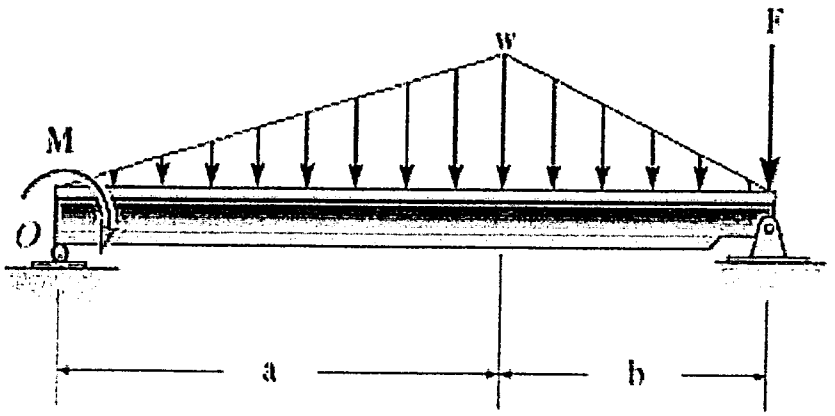

FIGURE Q4(a)

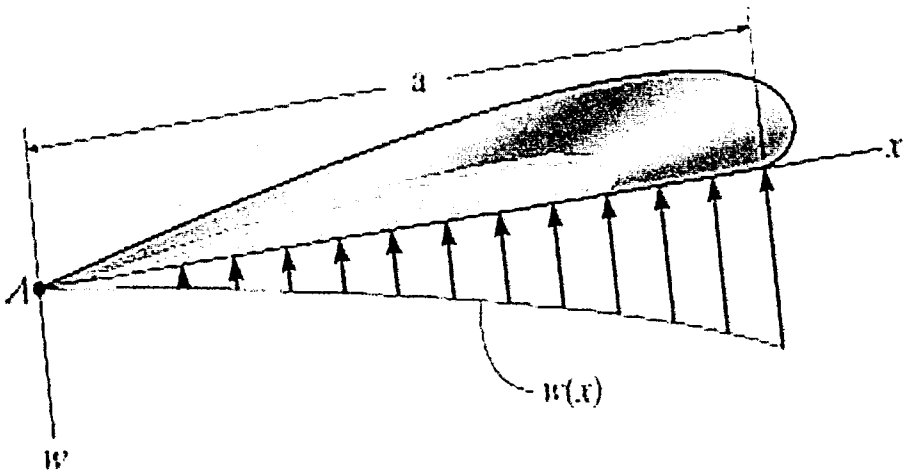

FIGURE Q4(b)

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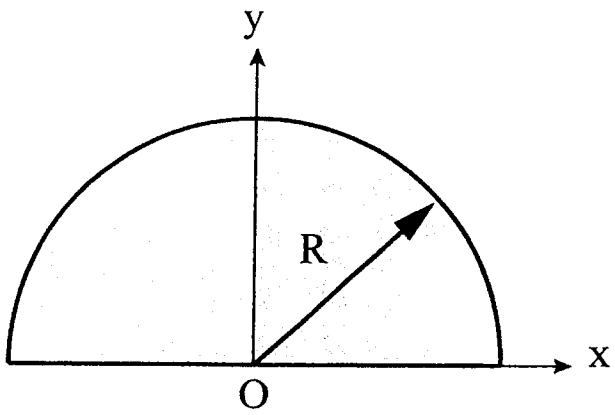

FIGURE Q5(a)

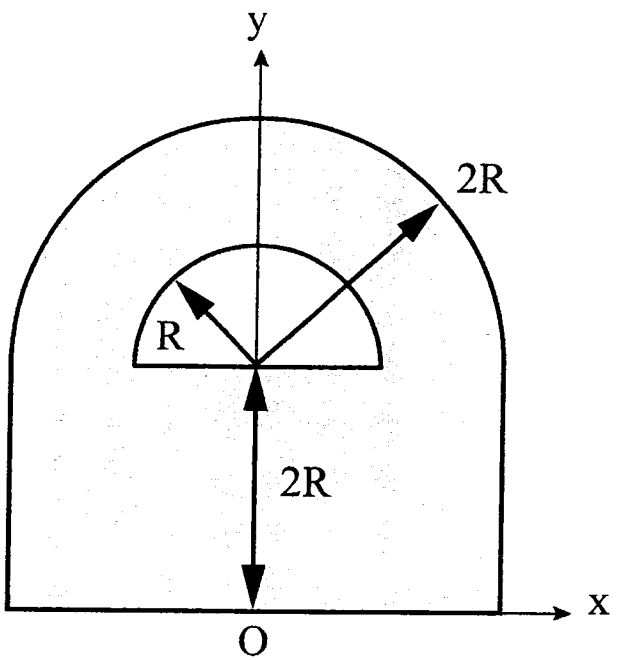

FIGURE Q5(b)

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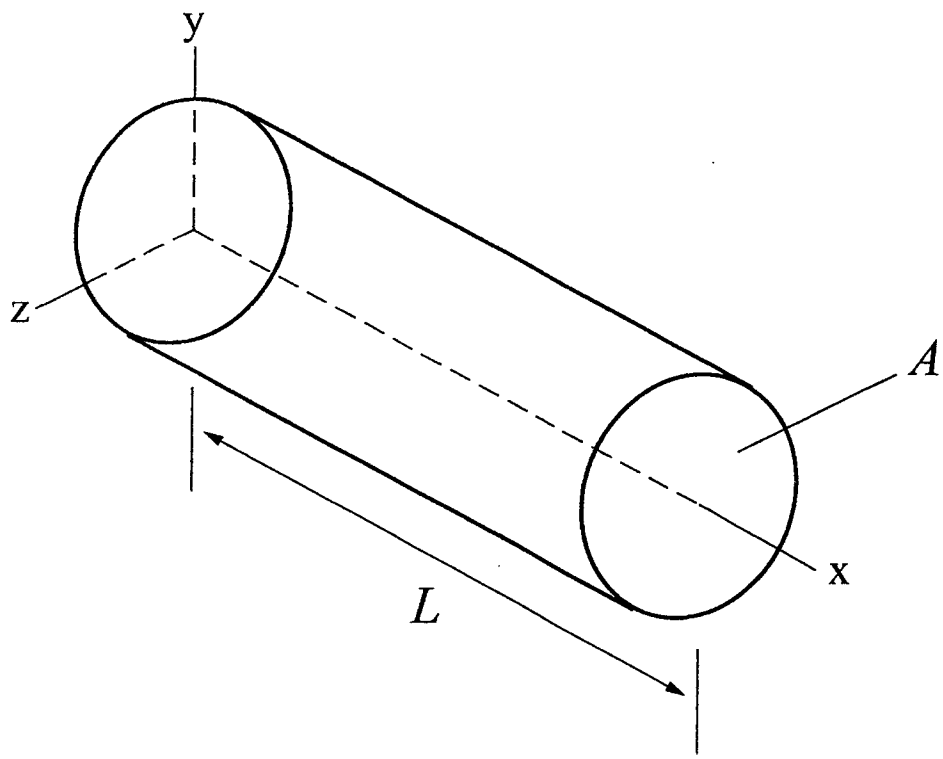

FIGURE Q6(a), (b)