



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION SEMESTER I SESSION 2010/2011

COURSE NAME : STATICS AND DYNAMICS
COURSE CODE : BFC 1022/BFC 10102
PROGRAMME : 1 BFF
EXAMINATION DATE : NOVEMBER/DECEMBER 2010
DURATION : 2 HOURS
INSTRUCTION : ANSWER QUESTION Q1 IN
PART A AND THREE (3)
QUESTIONS IN PART B.

THIS PAPER CONSISTS OF ELEVEN (11) PAGES

PART A

- Q1** (a) (i) State **One (1)** requirement of Newton Law and give an example. (4 marks)
- (ii) Briefly explain the comparison between mass and weight and its relationship with acceleration of gravity. (6 marks)
- (b) A 10 kg cylinder has a chord wound in a 0.5 m diameter groove at its centre A shown in Figure Q1. Assume there is no slippage and tension of 200 N is applied. Determine the acceleration a_c of the centre of mass of the wheel, and the minimum coefficient of static friction. The external diameter of the wheel is 4.0 m. (15 marks)

PART B

- Q2** (a) Describe with example the meaning of
- (i) Area
 (ii) Force
 (iii) Velocity (6 marks)
- (b) 100 kg of sugar, 5 N of onion, 20 lbs of meat and 1 slug of rice are placed on the weighing. What is the total weight of the groceries in unit kN. Given 1 lb is equal to 0.454 kg and 1 slug equal to 14.6 kg. (4 marks)
- (c) Forces of $OA = 30\text{ N}$, $OB = 50\text{ N}$, $CO = 15\text{ N}$, $DO = 80\text{ N}$, $OE = 150\text{ N}$, meet at point where the angle are $BOA = 45^\circ$, $COA = 90^\circ$, $DOA = 135^\circ$ and $EOA = 270^\circ$. Calculate the resultant force. (6 marks)
- (d) A push of 36 lb acts horizontally at point upon a roof truss and at the same point inclined to it at an angle of 135° in an anti-clockwise direction is a pull of 70 lb. Find the resultant force acting at the given point. (6 marks)
- (d) In your opinion, why do we need to learn applied mechanics in civil engineering? (3 marks)

- Q3** (a) Based on Figure Q3(a), explain the different when we calculate the moment about point A using moment and couples approach. (Show the calculation to prove it).
(5 marks)
- (b) Based on Figure Q3(b), calculate the moment about point O due to the forces on the truss. (*Hint: The missing dimension is not required if you show all possible couples*).
(14 marks)
- (c) If forces C and O in Figure Q3(c) form a couple that opposes the couple made up by forces A and B. Determine new forces of C and O.
(6 marks)
- Q4** (a) Determine the minimum force F required to push the two cylinders up on the slope as shown in Figure Q4(a). Each cylinder weighs 50 kg. The coefficient of static friction at the contacting surfaces are $\mu_A = 0.25$, $\mu_B = 0.2$, and $\mu_C = 0.5$.
(12 marks)
- (b) Blocks A and B with mass 7 kg and 12 kg, respectively are connected to the weightless links as shown in Figure Q4(b). Determine the maximum force P that can be applied at C without causing any movement. The coefficient of static friction between the blocks and the contacting surfaces is $\mu_s = 0.5$.
(13 marks)
- Q5** (a) Explain the different between center of gravity and centroid. Give example of any structure related.
(6 marks)
- (b) Name three (3) types of centroid.
(4 marks)
- (c) Determine the centroid, \bar{x} and \bar{y} for the combined area structure as shown in Figure Q5.
(15 marks)
- Q6** (a) Define moment of inertia.
(4 marks)
- (b) Determine the moment of inertia of all three cross sections shown in Figure Q6 about the x and y axes.
(21 marks)

BAHAGIAN A

- S1 (a) (i) Nyatakan salah Satu (1) syarat dalam hukum pergerakan Newton serta berikan contoh yang sesuai.
(4 markah)
- (ii) Terangkan dengan ringkas perbezaan di antara jisim dan berat serta hubungannya dengan pecutan graviti.
(6 markah)
- (b) Berat satu penggulung tali berbentuk silinder berdiameter 0.5 m ialah 10 kg yang dialurkan di tengah. Anggapkan tiada geluncuran berlaku dan tegangan dalam tali yang ditarik ialah 200 N. Tentukan pecutan a_c titik tengah pusat jisim roda tersebut, dan pekali geseran statik minimum. Diameter luar bagi roda tersebut ialah 4.0 m.
(15 markah)

BAHAGIAN B

- S2 (a) Terangkan bersama contoh maksud kepada
- (i) Luas
(ii) Daya
(iii) Halaju
(6 markah)
- (b) 100 kg gula, 5 N bawang, 20 lbs daging and 1 slug beras diletakkan di atas pemberat. Berapakah jumlah berat bahan tersebut dalam unit kN. Diberi 1 lb bersamaan 0.454 kg dan 1 slug bersamaan 14.6 kg.
(4 markah)
- (c) Daya $OA = 30\text{ N}$, $OB = 50\text{ N}$, $CO = 15\text{ N}$, $DO = 80\text{ N}$, $OE = 150\text{ N}$, bertemu pada satu titik dengan sudut $BOA = 45^\circ$, $COA = 90^\circ$, $DOA = 135^\circ$ and $EOA = 270^\circ$. Kirakan daya paduan yang terhasil.
(6 markah)
- (d) Daya tolakan seberat 36 lb bertindak mendatar pada titik di atas kekuda bumbung dan pada titik yang sama daya condong seberat 70 lb bertindak pada sudut 135° lawan jam. Tentukan daya paduan yang bertindak pada titik tersebut.
(6 markah)
- (d) Pada pendapat anda, kenapakah kita perlu untuk mempelajari mekanik kenaan dalam kejuruteraan awam?
(3 markah)

- S3 (a) Berdasarkan pada Rajah Q3(a), jelaskan perbezaan apabila kaedah pengiraan momen terhadap titik A menggunakan kaedah momen dan pasangan. (Tunjukkan bukti pengiraan jika perlu).
(5 markah)
- (b) Berdasarkan pada Rajah Q3(b), kirakan momen terhadap titik O disebabkan oleh daya-daya yang wujud pada kerangka. (*Petunjuk:* Dimensi yang tiada tidak diperlukan jika anda dapat tunjukkan kesemua pasangan yang berkemungkinan).
(14 markah)
- (c) Jika daya-daya C dan O seperti dalam Rajah Q3(c) menghasilkan nilai pasangan yang berlawanan daripada pasangan yang dihasilkan oleh daya-daya A dan B. Tentukan nilai daya-daya C dan O.
(6 markah)
- S4 (a) Tentukan daya minimum F yang diperlukan untuk menolak dua silinder ke atas cerun seperti yang ditunjukkan dalam Rajah Q4(a). Setiap silinder mempunyai berat 50 kg. Pekali geseran static pada permukaan bersentuh adalah $\mu_A = 0.25$, $\mu_B = 0.2$, and $\mu_C = 0.5$.
(12 markah)
- (b) Blok A and B dengan berat 7 kg dan 12 kg, masing-masing adalah bersambung di C seperti dalam Rajah Q4(b). Tentukan daya maksimum P yang boleh dikenakan di C tanpa menyebabkan sebarang pergerakan. Pekali geseran static antara blok dan permukaan bersentuhan ialah $\mu_s = 0.5$.
(13 markah)
- S5 (a) Jelaskan perbezaan di antara titik tengah graviti dan sentroid. Berikan contoh-contoh struktur yang sesuai.
(6 markah)
- (b) Namakan tiga (3) jenis sentroid.
(4 markah)
- (c) Tentukan nilai sentroid, \bar{x} dan \bar{y} untuk luas campuran struktur seperti yang ditunjukkan oleh Rajah Q5.
(15 markah)

- S6 (a) Berikan definisi momen sifat tekun. (4 markah)
- (b) Tentukan momen sifat tekun bagi semua tiga keratan rentas seperti yang ditunjukkan dalam Rajah Q6 terhadap paksi x dan paksi y. (21 markah)

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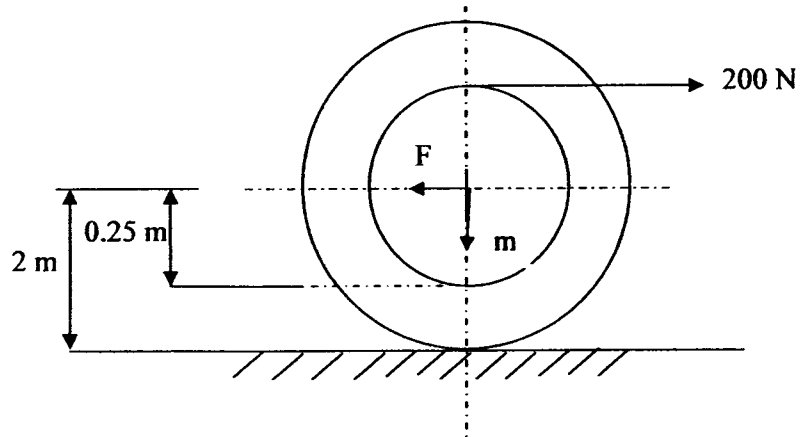


FIGURE Q1

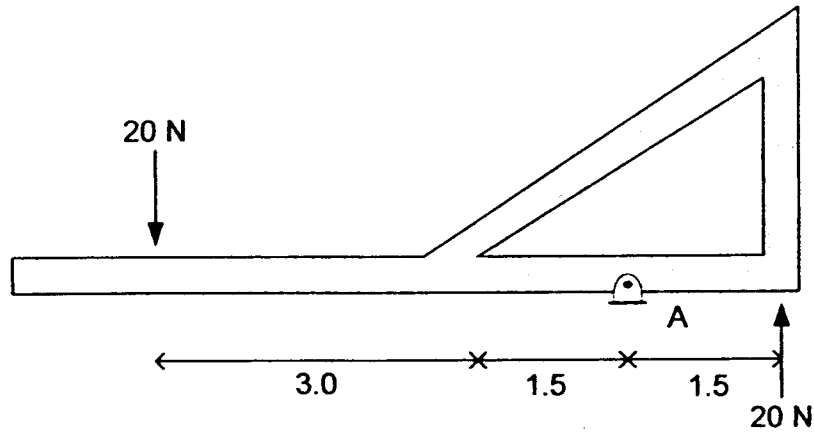


FIGURE Q3(a)

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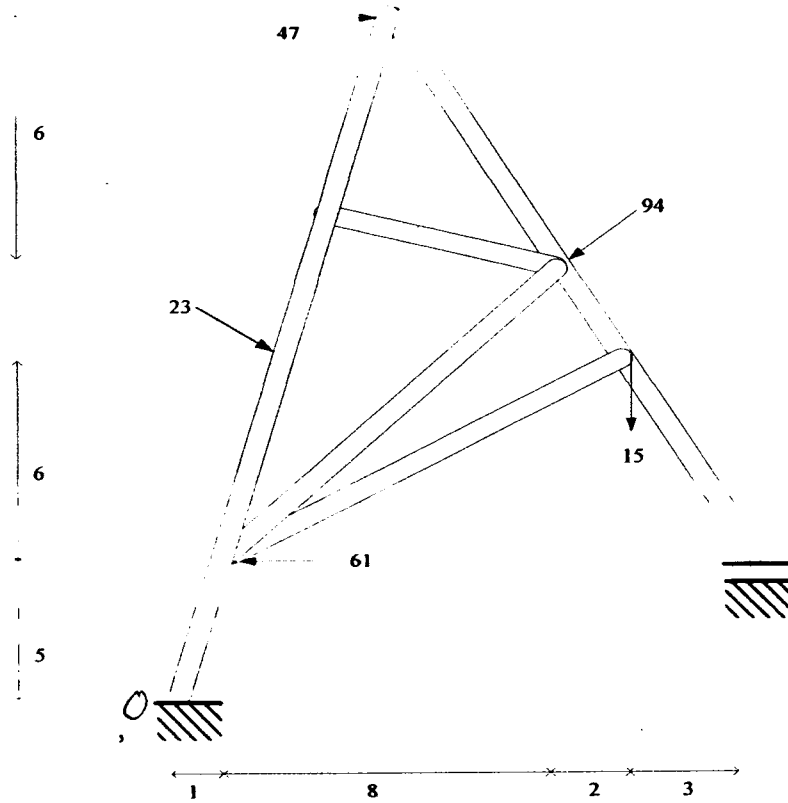


FIGURE Q3(b)

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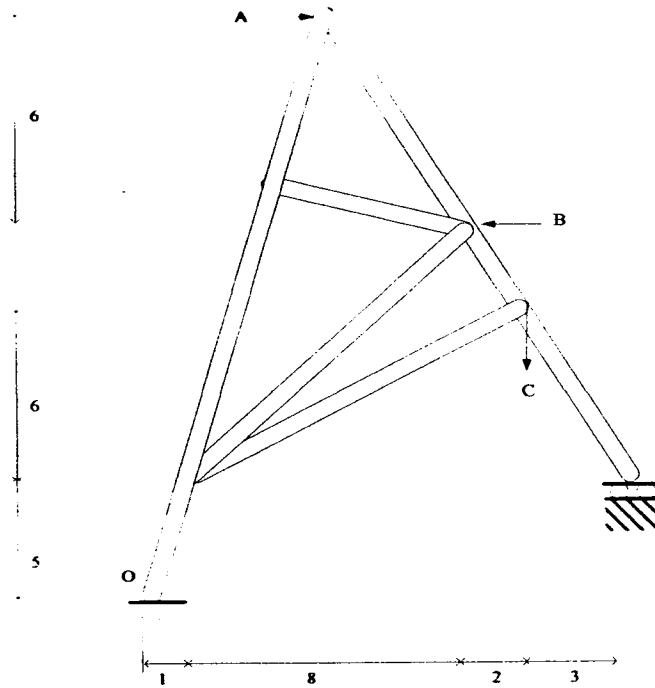


FIGURE Q3(c)

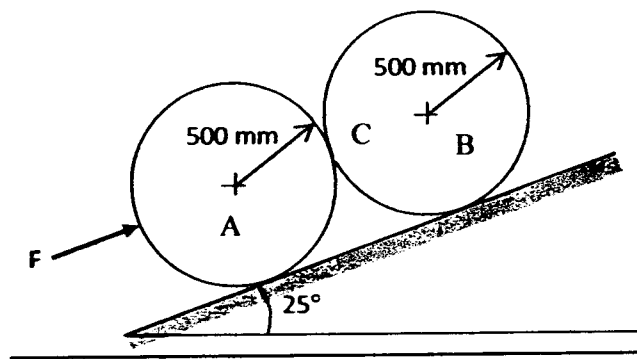


FIGURE Q4(a)

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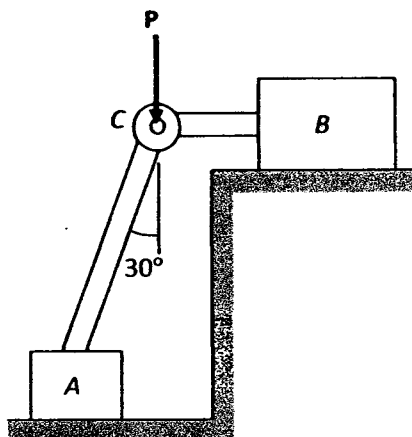


FIGURE Q4(b)

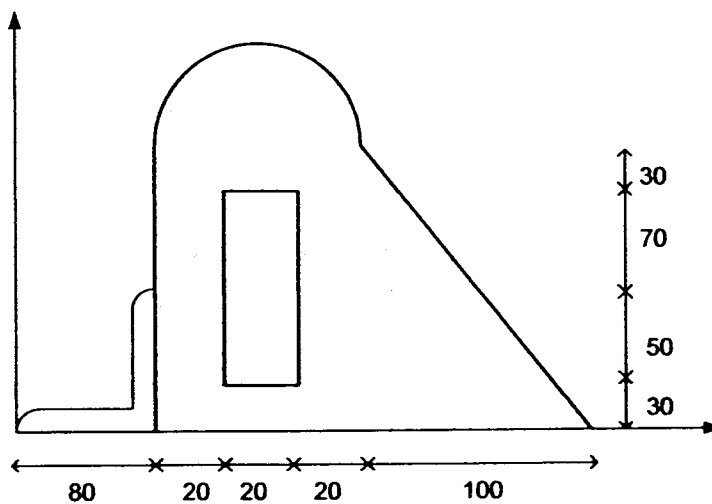


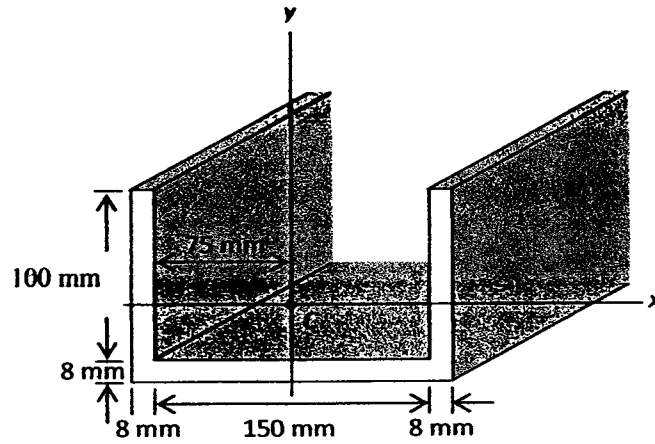
FIGURE Q5

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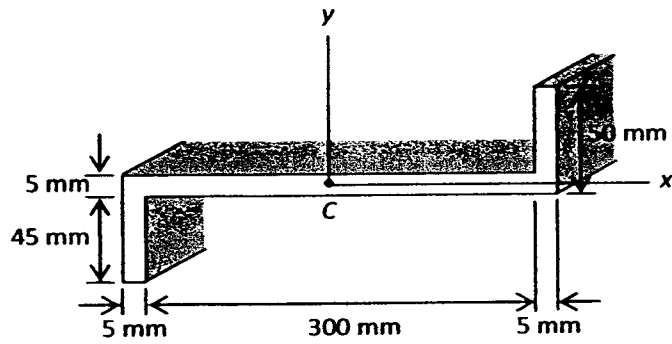
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(i)



(ii)



(iii)

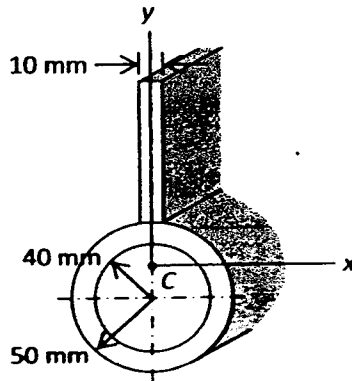


FIGURE Q6