UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME	:	STATICS
COURSE CODE	:	BNP 10102
PROGRAMME	:	BNA/BNB/BNC
EXAMINATION DATE	:	DECEMBER 2013/JANUARY 2014
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **TEN (10)** PAGES

Q1 (a) (i) List **Four (4)** basic units in the SI system and write the symbol for each.

(4 marks)

(ii) Explain **Two (2)** requirements of Newton Law and give an example of each requirement.

(4 marks)

(iii) Convert 98 slug/ft^3 and 270 lb.s to appropriate SI units.

(4 marks)

(b) (i) Two force 60N and 80N act on A as shown in **Figure Q1 (a)**. Determine the resultance force R and angle θ.

(6 Marks)

(ii) A barge is pulled by two tugboat as shown in **Figure Q1 (b)**. If the resultance forces exerted by the tugboat is 5kN force directed along the axis of the barge, determine the tension of rope A and C knowing that $\alpha = 45^\circ$

(7 Marks)

Q2 (a) (i) Base on your understanding, explain what is the significant of calculating the reaction and moment on the structure.

(6 marks)

(ii) Give **Two (2)** examples where the application applies on the real construction.

(4 marks)

(b) **Figure Q2** shows a beam loaded with forces

(i) Draw free body diagram by showing all acting forces at point A, B and C.
(ii) Find the reaction forces act on point A and C
(iii) Determine the couples of moment acting on the beam

(15 marks)

Q3 (a) Determine the reactions at A and B for the beam loaded as shown in **Figure Q3 (a)**.

(5 marks)

(b) Determine the reactions at A and B, and the moment at point **A** on the beam loaded as shown in **Figure Q3 (b).** The loads are in kilonewtons (kN). Neglect the thickness and mass of the beam.

(10 marks)

(c) A boom 20m long support a load 2300 kg as shown in **Figure Q3 (c)**. The cable BC is horizontal and 10m long.

(i) Determine the resultant force in the cable and the boom

(5 marks)

(ii) Find the magnitude of the force.

(5 marks)

Q4 (a) State the equations for equilibrium that can be used for solving the three dimensional problems.

(5 marks)

(b) A horizontal plate is represented by grid as shown in **Figure Q4**. Each square has sides' 5 ft length. The plate is supported at A, B and C and has 45 lb applied as shown. Neglect the weight of the plate and determine:

(i) The reactions at A.

(6 marks)

(ii) The reaction at B.

(7 marks)

(iii) The reaction at C.

(7 marks)

Q5 (a) State and draw the **Four (4)** conclusions of friction laws for dry surfaces on an inclined plane.

(8 marks)

(b) **Figure Q5** shows the column channel section. Determine:

(i) The centroid about x and y axis.

(8 marks)

(ii) The moment of inertia about x and y axis.

(9 marks)

- END OF QUESTION -

S1 (a) (i) Senaraikan **Empat (4)** unit asas dalam sistem SI dan tuliskan simbol bagi setiap unitnya

(4 markah)

(ii) Jelaskan **Dua (2)** syarat Hukum Newton dan berikan contoh bagi setiap syarat tersebut.

(4 markah)

(ii) Tukarkan 98 slug/ft3 dan 270 lb.s kepada unit SI yang sesuai

(4 markah)

(b) (i) Dua daya iaitu 60N dan 80N dikenakan pada titk A seperti yang ditunjukkan dalam **Rajah Q1 (a)**. Tentukan daya paduan, R dan sudutnya, θ.

(6 markah)

(ii) Tongkang A ditarik oleh dua bot tunda seperti yang ditunjukkan dalam **Rajah Q1 (b)**. Jika daya paduan dikenakan oleh kapal tunda adalah sebanyak 5kN diarahkan di sepanjang paksi tongkang, tentukan ketegangan tali A dan C, diberi $\alpha = 45^\circ$

(7 markah)

S2 (a) (i) Berdasarkan pemahaman anda, terangkan kepentingan pengiraan daya tindakbalas dan momen pada struktur.

(6 markah)

(ii) Berikan **Dua (2)** contoh pengiraan daya tindakbalas dan momen digunakan dalam bidang pembinaan.

(4 markah)

(b) **Rajah Q2** menunjukkan rasuk yang dikenakan dengan daya.

(i) Lukiskan gambarajah bebas bagi rasuk. Tunjukkan semua daya Tindakbalas pada titik A, B dan C.

(ii) Dapatkan daya tindakbalas pada titik A dan C.

(iii) Tentukan momen tindakbalas yg bertindak pada rasuk.

(15 markah)

S3 (a) Tentukan tindakbalas pada A dan B bagi rasuk yang dikenakan beban seperti yang ditunjukkan dalam **Rajah Q3 (a)**

(5 markah)

(b) Tentukan tindakbalas pada A dan B, dan momen di titik A pada sebatang rasuk yang mempunyai beban seperti yang ditunjukkan pada **Rajah Q3 (b)**. Ukuran beban adalah dalam unit kilonewton (kN). Abaikan ketebalan dan berat rasuk tersebut.

(10 markah)

(c) Satu joran (boom) pada kren yang mempunyai sokong sepanjang 20m dikenakan beban sebanyak 2300 kg seperti yang ditunjukkan dalam **Rajah Q3 (c)**. Kabel **BC** yang merupakan sokongan mendatar mempunyai panjang sebanyak 10m.

(i) Tentukan daya paduan pada kabel dan joran (boom)

(5 markah)

(ii) Dapatkan magnitud bagi daya tersebut.

(5 markah)

S4 (a) Nyatakan persamaan keseimbangan yang boleh digunakan untuk menyelesaikan masalah tiga dimensi.

(5 markah)

(b) Satu plat melintang dipersembahkan oleh grid seperti ditunjukkan dalam **Rajah Q4**. Setiap segiempat mempunyai panjang 5 ft. Plat ini disokong pada A, B dan C dan mempunyai beban 45 lb yang dikenakan seperti yang ditunjukkan. Abaikan berat plat dan tentukan:

(i) Tindakbalas pada A.

(6 markah)

(ii) Tindakbalas pada B.

(7 markah)

(iii) Tindakbalas pada C.

(7 markah)

S5 (a) Nyatakan dan lukiskan **Empat (4)** kesimpulan bagi hukum geseran untuk permukaan kering pada satah condong.

(8 markah)

(b) **Rajah Q5** menunjukkan keratan saluran tiang. Tentukan:

(i) Titik tengah bagi paksi x dan y.

(8 markah)

(ii) Momen sifatekun bagi paksi x dan y.

(9 markah)

-SOALAN TAMAT-

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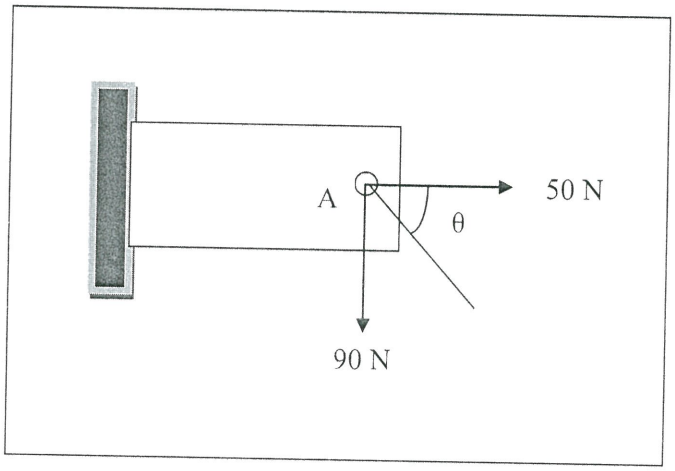

FIGURE Q1(a)

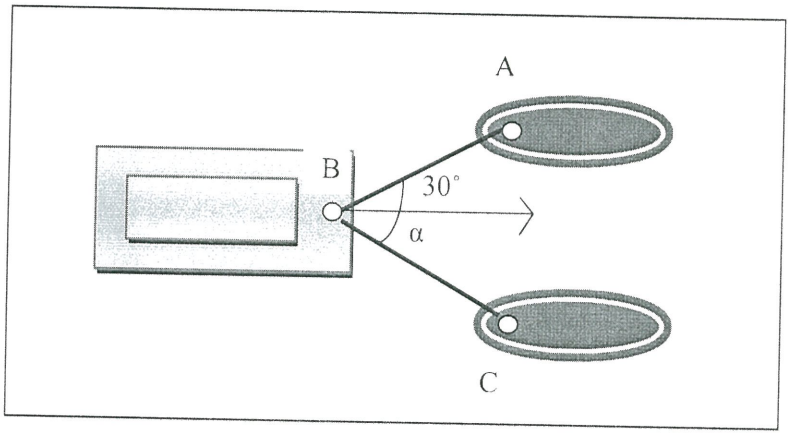

FIGURE Q1(b)

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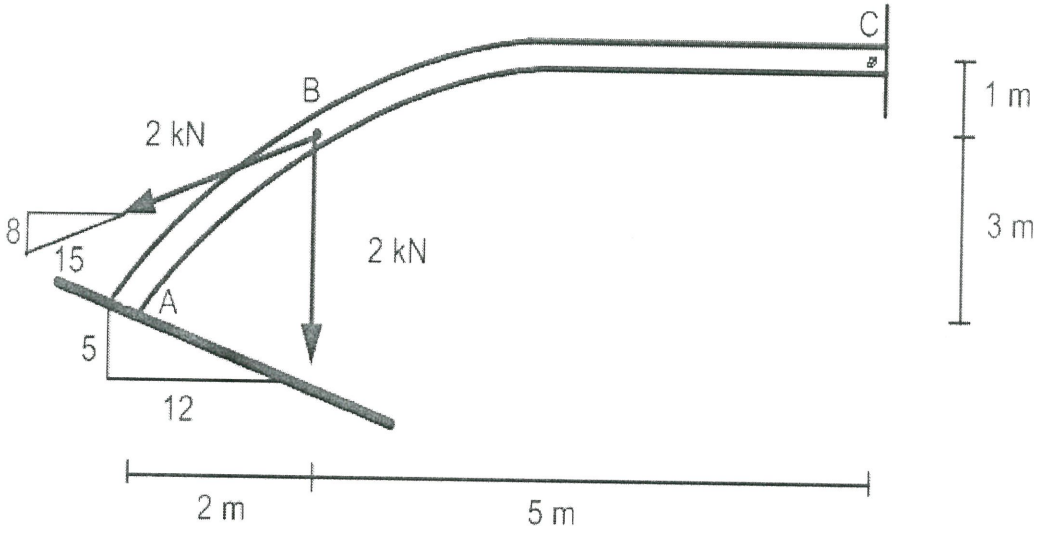

FIGURE Q2

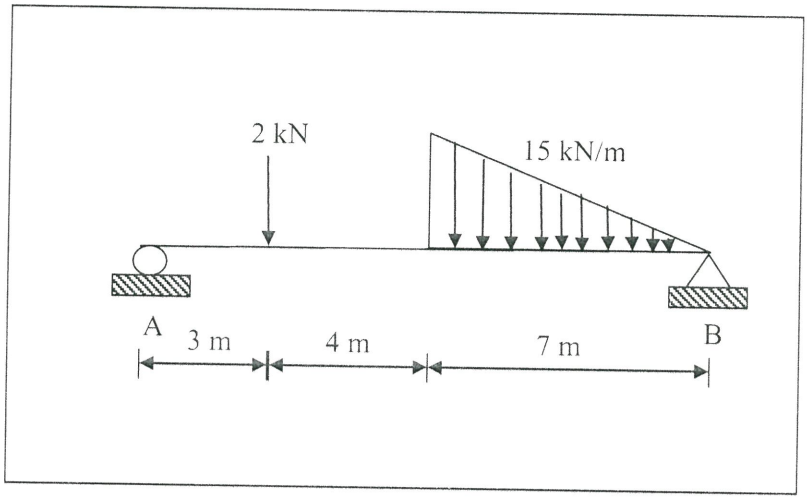

FIGURE Q3 (a)

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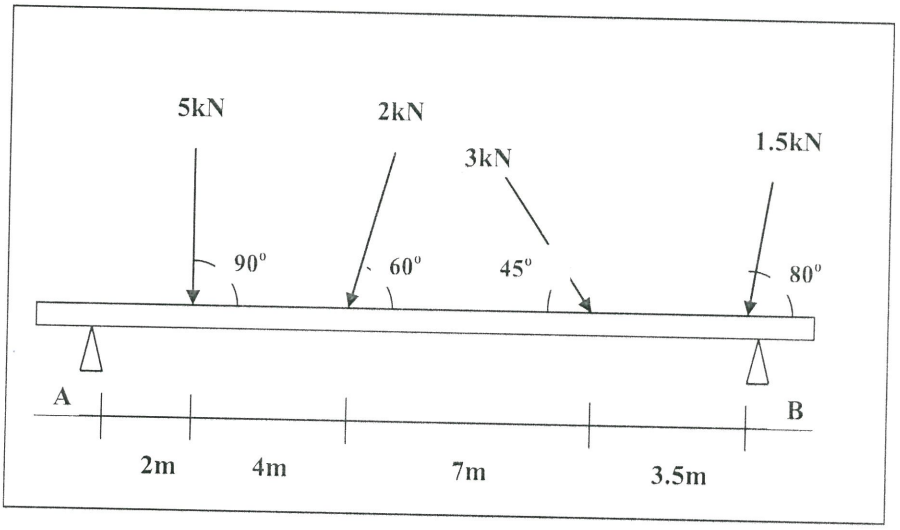

FIGURE Q3 (b)

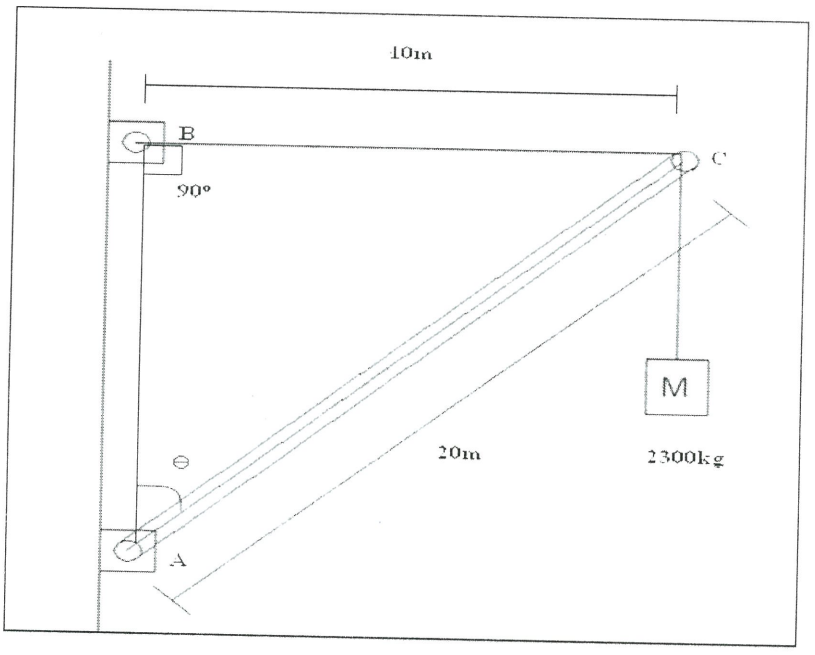

FIGURE Q3 (c)

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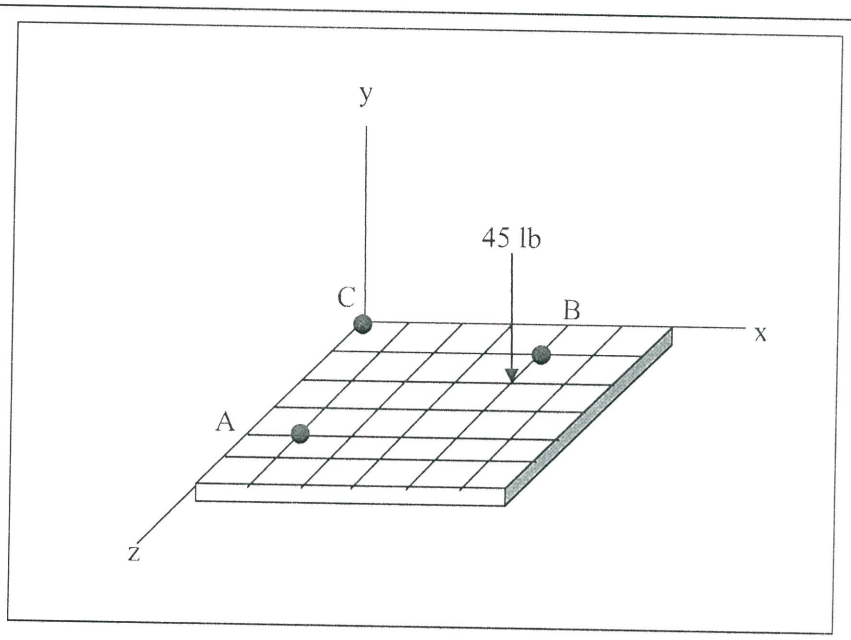

FIGURE Q4

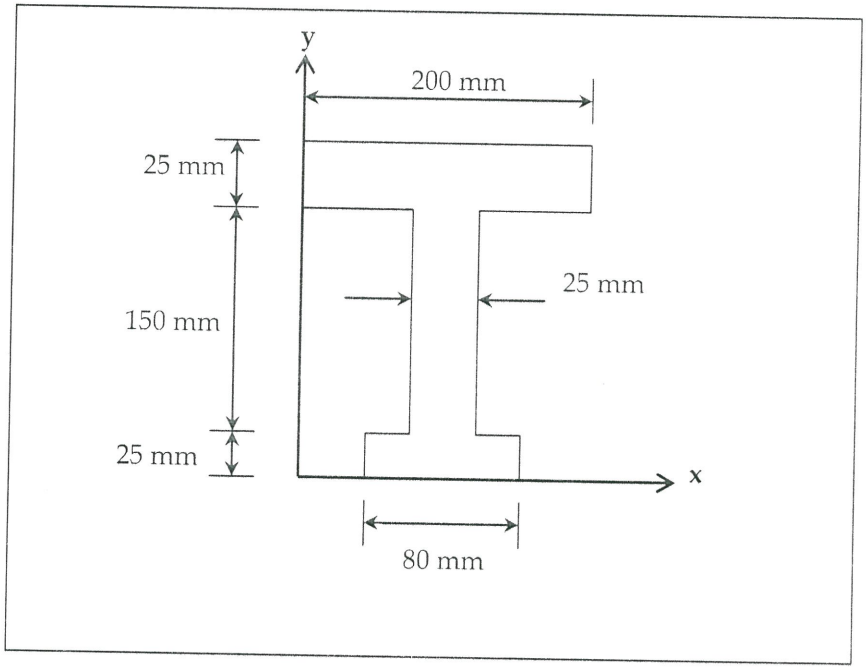

FIGURE Q5

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APPENDIX

$$V = \frac{4}{3}\pi r^3$$

$$F = G\left(\frac{m_A + m_B}{r}\right)$$

$$A_1 y_1 + A_2 y_2 + A_3 y_3 ..... = A\bar{y}$$

$$L_1 y_1 + L_2 y_2 + L_3 y_3 ..... = L\bar{y}$$

$I_x = I_c + Ad^2$

$I_x = I_c + md^2$

Rectangular prism, $I_c = \frac{1}{12} m(a^2 + b^2)$

Thin disk, $I_c = \frac{1}{2} mr^2$