Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018

COURSE NAME	:	STATICS
COURSE CODE	:	DAM 10103
PROGRAMME CODE	:	DAM
EXAMINATION DATE	:	DECEMBER 2017 / JANUARY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **ELEVEN (11)** PAGES

BAHASA MELAYU

S1 **Tiga (3)** daya bertindak ke atas pendakap seperti ditunjukkan dalam **Rajah S1**;

(a) kirakan magnitud daya paduan yang bertindak ke atas pendakap dan arahnya diukur mengikut arah jam dari paksi positif x jika F1 = 250 N dan $\phi = 30^{o}$,

(8 markah)

(b) tentukan magnitud F1 dan arah ϕ, jika magnitud daya paduan yang bertindak ke atas pendakap adalah 400 N diarahkan sepanjang paksi positif x.

(12 markah)

S2 (a) Nyatakan ciri-ciri keseimbangan zarah.

(2 markah)

(b) Tiga daya F1, F2 dan F3 bertindak pada zarah P seperti yang ditunjukkan dalam **Rajah S2(b)**. Tentukan magnitud daya F1 dan F2 jika magnitud daya F3 adalah 400N dan zarah P berada di dalam keseimbangan.

(6 markah)

(c) Sebuah blok berjisim m digantung di dalam kedudukan seperti ditunjukkan di dalam **Rajah S2(c)**. Setiap kabel hanya boleh menyokong ketegangan maksimum 800N;

(i) diberi $\theta \neq 0°$ dan $cos\ \theta = \sqrt{1 - \sin^2\theta}$, tentukan nilai sudut θ untuk keseimbangan,

(ii) tentukan jisim maksimum m untuk keseimbangan.

(12 markah)

S3 (a) Jelaskan tentang momen gandingan.

(4 markah)

(b) **Rajah S3(b)** menunjukkan *platform* yang diletakkan di atas rasuk dan mempunyai beban teragih berkadaran dengan fungsi $w = \frac{1}{2}(4-x)^2$ dan beban teragih seragam 4 kN/m;

(i) kirakan jarak a bemula dari titik A bilamana daya paduan adalah 166.67 kN,

(ii) sebuah motosikal berjisim 100 kg berhenti di atas platform yang curam dan menghasilkan momen gandingan yang bertindak pada titik A, momen yang terhasil adalah 3074.3 kNm, kirakan jarak kedudukan motosikal tersebut dari titik A. (Pecutan graviti adalah 9.81 m/s^2).

(16 markah)

S4 (a) Satu daya P bertindak pada titik D seperti yang ditunjukkan dalam **Rajah S4(a)**. Diberi magnitud daya P ialah 12 kN, tentukan daya dalam setiap anggota kekuda. Nyatakan sama ada setiap anggota kekuda berada dalam ketegangan atau pemampatan.

(10 markah)

(b) **Rajah S4(b)** menunjukkan bahagian struktur jambatan;

(i) tentukan magnitud daya tindakbalas pada penyokong A dan E di dalam arah x dan y.

(ii) dengan menggunakan kaedah keratan, tentukan daya pada anggota CD, CF dan FG bagi kekuda tersebut. Nyatakan samada setiap anggota kekuda berada di dalam ketegangan atau pemampatan.

(10 markah)

S5 (a) Huraikan secara ringkas tentang pusat graviti.

(2 markah)

(b) Terangkan pada keadaan bagaimanakah sentroid akan menyamai pusat graviti.

(4 markah)

(c) Tentukan sentroid (X,Y) bagi kawasan yang berlorek pada **Rajah S5(c)**.

(14 markah)

S6 (a) Takrifkan geseran dan jelaskan mengapa geseran kinetik lebih rendah berbanding geseran statik.

(4 markah)

(b) Nyatakan punca-punca berlakunya geseran.

(4 markah)

(c) **Tiga (3)** bongkah disusun seperti dalam **Rajah S6(c)**. Sudut bongkah A ialah 15° dan pekali geseran statik pada semua permukaan bersentuhan ialah $\mu s = 0.30$. Jika takal bebas daripada geseran, tentukan jisim M_1 (Bongkah A) yang minimum untuk memulakan pergerakan bongkah B.

(12 markah)

- SOALAN TAMAT -

ENGLISH

Q1 ***Three (3)*** *forces act on the bracket shown in* ***Figure Q1****;*

(a) *calculate the magnitude of the resultant force acting on the bracket and its direction measured clockwise from the positive x axis if F1 = 250 N and* $\phi = 30^{o}$*,*

(8 marks)

(b) *determine the magnitude of F1 and its direction* ϕ*, if the magnitude of the resultant force acting on the bracket is to be 400 N directed along the positive x axis.*

(12 marks)

Q2 *(a)* *State the characteristics of a particle in equilibrium.*

(2 marks)

(b) *Three forces F1, F2 and F3 acted on a particle P shown in* ***Figure Q2(b)****. Determine the magnitude of force F1 and F2 if the magnitude of F3 is 400N and the particle P is in equilibrium.*

(6 marks)

(c) *A block of mass m is suspended in a position shown in* ***Figure Q2(c)****. Each cable can support a maximum tension of 800N;*

(i) *given that* $\theta \neq 0^{\circ}$ *and* $\cos\theta = \sqrt{1-\sin^2\theta}$*, determine the value of angle* θ *for equilibrium,*

(ii) *determine the maximum mass of m for equilibrium.*

(12 marks)

Q3 *(a)* *Describe the moment of a couple.*

(4 marks)

(b) ***Figure Q3(b)*** *shows a platform placed on a beam and has a distributed load proportional to the function* $w = \frac{1}{2}(4-x)^2$ *and the uniformly distributed load of 4 kN/m;*

(i) *calculate a distance a starting from the point A when the resultant force is 166.67 kN,*

(ii) *a motorcycle with a mass of 100 kg stopped on a slope platform and produces a couple moment acting at the point A, the resulting moment is 3074.3 kNm, calculate the distance of motorcycle from point A. (Acceleration of gravity is 9.81* m/s^2*).*

(16 marks)

Q4 *(a)* *A force P is acted on point D as shown in* ***Figure Q4(a)****. Given the magnitude of force P is 12 kN, determine the force in each member of the truss. State whether the members are in tension or compression.*

(10 marks)

(b) ***Figure Q4(b)*** *shows the part of a bridge's structure;*

(i) *determine the magnitude of the reaction forces at support A and E in x and y direction.*

(ii) *using the method of section, determine the forces in member CD, CF and FG of the truss. Indicate if the members are in tension or compression.*

(10 marks)

Q5 *(a)* *Describe briefly about centre of gravity.*

(2 marks)

(b) *Briefly explain in which condition centroid equal to center of gravity.*

(4 marks)

(c) *Determine the centroid (X,Y) of the shaded area in* ***Figure Q5(c).***

(14 marks)

Q6 *(a)* *Define friction and explain why kinetic friction is less than static friction.*

(4 marks)

(b) *State the causes of friction.*

(4 marks)

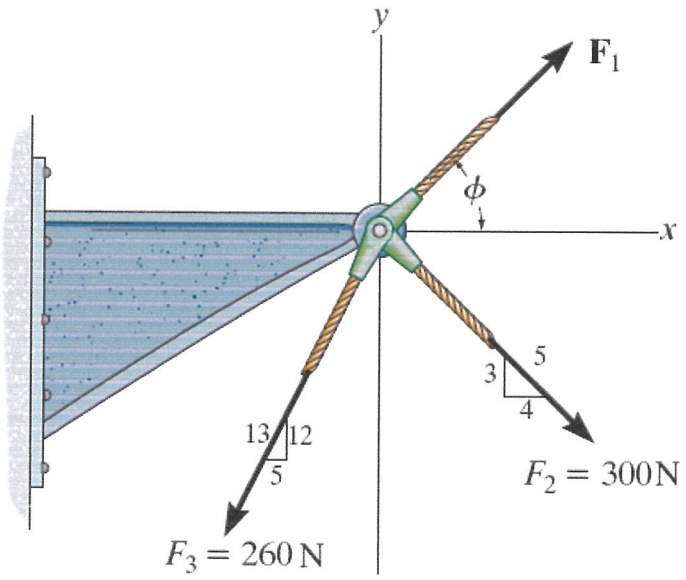
(c) ***Three (3)*** *blocks arranged as in* ***Figure S6(c)****. The angle of block A is 15° and the coefficient of static friction at all contact surfaces is* $\mu s = 0.30$*. If the pulley is frictionless, determine the minimum mass,* M_1 *of block A to start the movement of block B.*

(12 marks)

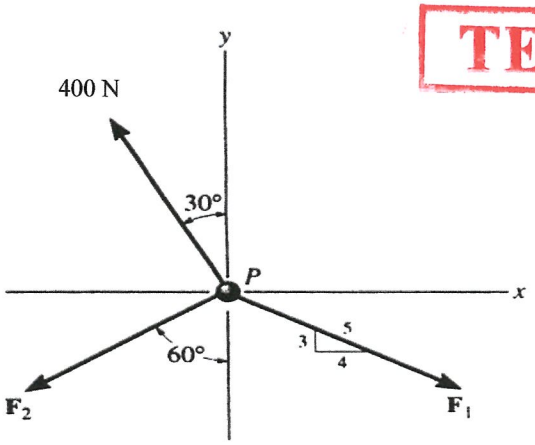
- END OF QUESTIONS -

PEPERIKSAAN AKHIR

SEMESTER/SESI	: SEM I / 2017/2018	KOD PROGRAM	: DAM
NAMA KURSUS	: STATIK	KOD KURSUS	: DAM 10103



Rajah S1 / *Figure Q1*



Rajah S2(b) / *Figure Q2(b)*

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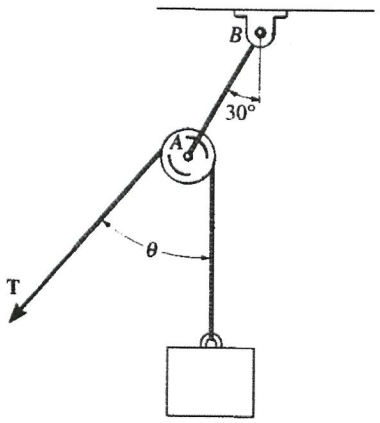
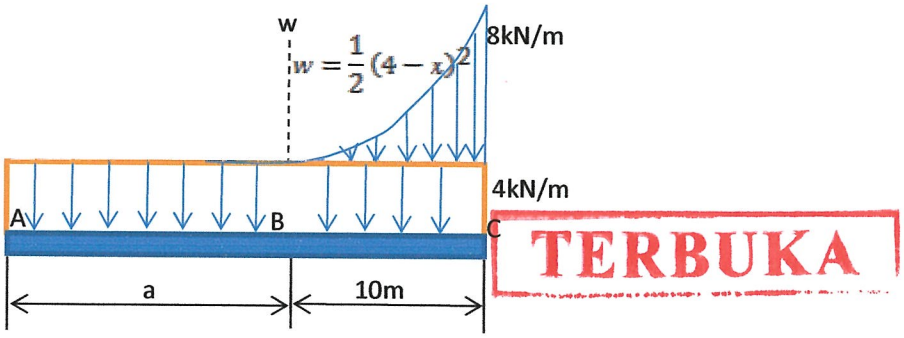


Rajah S2(c) / *Figure Q2(c)*



Rajah S3(b) / *Figure Q3(b)*

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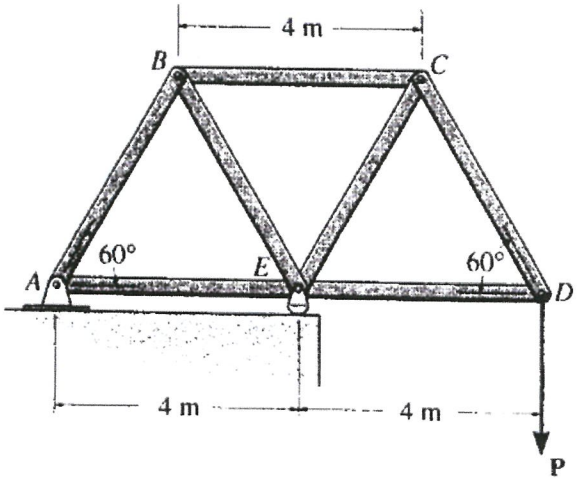
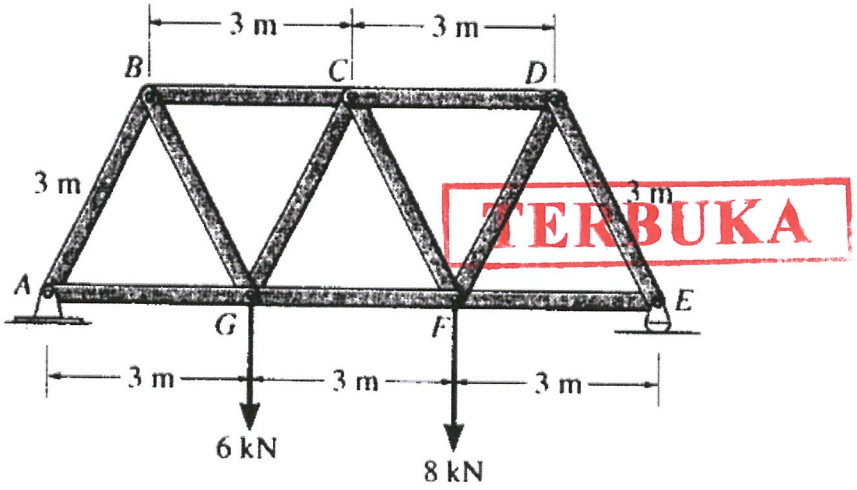


Rajah S4(a) / *Figure Q4(a)*



Rajah S4(b) / *Figure Q4(b)*

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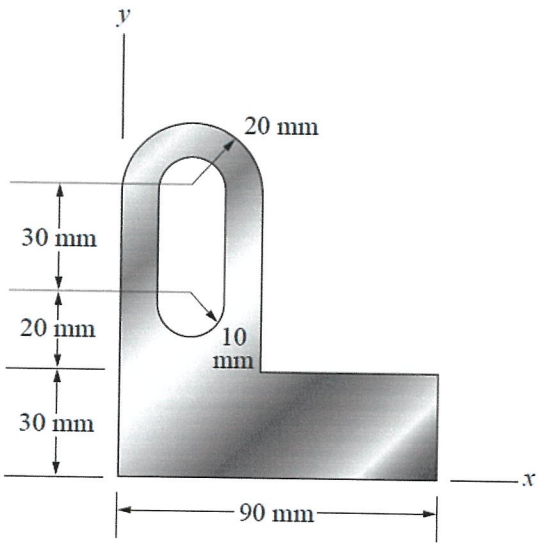
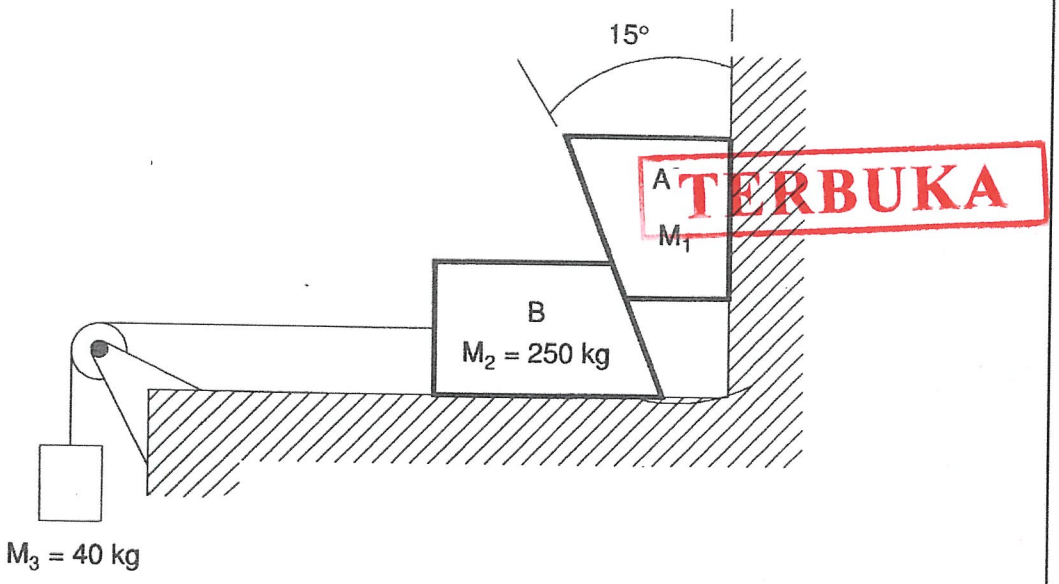


Rajah S5(c) / *Figure Q5(c)*



Rajah S6(c) / *Figure Q6(c)*

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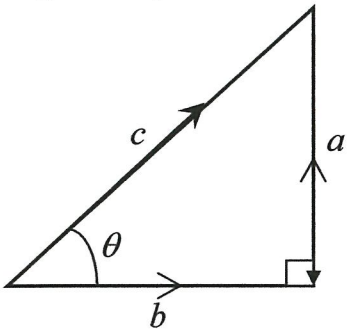
FORMULA:

1. Trigonometry



$$\sin\theta = \frac{a}{c} \qquad \sec\theta = \frac{c}{b} = \frac{1}{\cos\theta}$$

$$\cos\theta = \frac{b}{c} \qquad \operatorname{cosec}\theta = \frac{c}{a} = \frac{1}{\sin\theta}$$

$$\tan\theta = \frac{a}{b} = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{b}{a} = \frac{\cos\theta}{\sin\theta}$$

2. Integration $\int x^n dx = \frac{x^{n+1}}{n+1} + C \quad (n \neq -1)$

3. Differentiate $\frac{d}{dx}x^n = n^{x-1}$

4. Centroid

$$\bar{x} = \frac{\int \tilde{x}\, dW}{\int dW} \qquad \bar{y} = \frac{\int \tilde{y}\, dW}{\int dW} \qquad \bar{z} = \frac{\int \tilde{z}\, dW}{\int dW}$$

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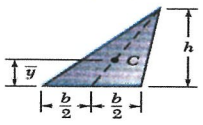
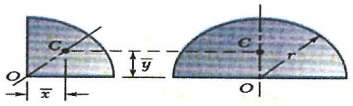
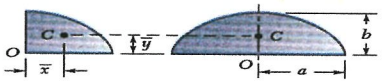
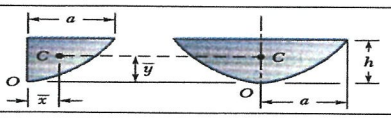
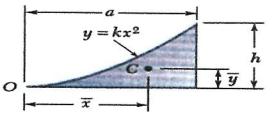
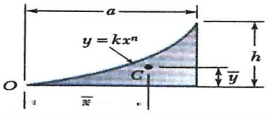
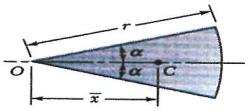
CENTROIDS OF COMMON SHAPES OF AREAS:

Shape		$\bar{x}$	$\bar{y}$	Area
Triangular area			$\frac{h}{3}$	$\frac{bh}{2}$
Quarter-circular area		$\frac{4r}{3\pi}$	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{4}$
Semicircular area		0	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{2}$
Quarter-elliptical area		$\frac{4a}{3\pi}$	$\frac{4b}{3\pi}$	$\frac{\pi ab}{4}$
Semielliptical area		0	$\frac{4b}{3\pi}$	$\frac{\pi ab}{2}$
Semiparabolic area		$\frac{3a}{8}$	$\frac{3h}{5}$	$\frac{2ah}{3}$
Parabolic area		0	$\frac{3h}{5}$	$\frac{4ah}{3}$
Parabolic spandrel		$\frac{3a}{4}$	$\frac{3h}{10}$	$\frac{ah}{3}$
General spandrel		$\frac{n+1}{n+2}a$	$\frac{n+1}{4n+2}h$	$\frac{ah}{n+1}$
Circular sector		$\frac{2r\sin\alpha}{3\alpha}$	0	αr^2