UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR
SEMESTER II
SESI 2010/2011

NAMA KURSUS	:	STATIK
KOD KURSUS	:	BDA 10203 / BDA 1023
PROGRAM	:	SARJANA MUDA KEJURUTERAAN MEKANIKAL DENGAN KEPUJIAN
TARIKH PEPERIKSAAN	:	APRIL / MEI 2011
JANGKA MASA	:	3 JAM
ARAHAN	:	JAWAB **SEMUA** SOALAN PADA **BAHAGIAN A** DAN PILIH **DUA (2)** SOALAN PADA **BAHAGIAN B**

KERTAS SOALAN INI MENGANDUNGI SEPULUH (10) MUKA SURAT

BAHAGIAN A : JAWAB SEMUA SOALAN

S1 (a) Berdasarkan kepada **Rajah S1 (a),**

(i) Tunjukkan cara bagaimana anda boleh mendapatkan titik sentriod bagi keratan rentas dengan menggunakan kaedah komposit.

(ii) Tentukan lokasi titik sentroid ($\bar{x}$) bagi luas keratan rentas komposit tersebut.

(12 markah)

(b) Berdasarkan kepada **Rajah S1 (b),** tentukan lokasi titik sentroid ($\bar{x}, \bar{y}$) bagi luas komposit tersebut.

(8 markah)

S2 Sebuah lampu mempunyai berat 15 kg dan disokong pada tiang AO dan kabel AB dan AC, seperti ditunjukkan di dalam **Rajah S2.** Dalam keseimbangan, sekiranya daya di tiang bertindak disepanjang paksinya,

(a) Tentukan daya di AO,

(b) Tentukan daya di AB, dan

(c) Tentukan daya di AC.

(20 markah)

S3 **Rajah S3** menunjukkan seorang pekerja menggunakan trak tangan untuk mengalihkan bahan dengan menuruni sebuah gelangsar. Sekiranya trak dan kandungannya dipegang pada kedudukan seperti ditunjukkan dalam **Rajah S3,** dan mempunyai berat W dengan titik graviti G,

(a) Tentukan daya paduan normal pada kedua-dua tayar di A, dan

(b) Tentukan magnitud daya yang diperlukan di B.

Di beri : W = 100 N, a = 0.3 m, b = 0.45 m, c = 0.6 m, d = 0.525 m, e = 0.45 m

f = 0.15 m, $\theta = 60°$, $\phi = 30°$.

(20 markah)

BAHAGIAN B : JAWAB DUA SOALAN SAHAJA

S4 (a) Daya sejumlah F = 200 N pada arah tertentu bertindak pada gear seperti ditunjukkan di dalam **Rajah S4 (a).** Maka, tentukan momen untuk daya ini yang bertindak paksi y.

(6 markah)

(b) Sekiranya daya tegangan diberikan pada kabel panel adalah F = 700 N seperti ditunjukkan dalam **Rajah S4 (b),** tentukan magnitud momen yang dihasilkan oleh daya ini pada paksi engsel CD.

(14 markah)

S5 Kerangka atap yang diberikan daya menegak, F = 15 kN adalah seperti ditunjukkan dalam **Rajah S5.**

(a) Senaraikan semua penyambung berdaya sifar untuk kerangka atap tersebut.

(4 markah)

(b) Lukiskan Gambarajah Badan Bebas (GBB) kerangka atap dan GBB bahagian kerangka yang dipilih selepas pemotongan untuk menyelesaikan soalan S5 (c).

(4 markah)

(c) Tentukan daya pada penyambung-penyambung KJ, NJ dan CD, serta nyatakan sama ada penyambung-penyambung tersebut dalam keadaan tegangan atau mampatan.

(12 markah)

S6 (a) Terangkan apa yang anda faham berkenaan geseran.

(3 markah)

(b) Merujuk kepada **Rajah S6,** pekali geseran statik antara baji B - C adalah μ_1 = 0.6 dan antara permukaan B – A dan C – D, μ_2 = 0.4. Sekiranya pegas termampat sebanyak 200 mm seperti dalam kedudukan yang ditunjukkan,

(i) Lukiskan Gambajarah Badan Bebas (GBB) untuk baji B dan baji C.

(ii) Tentukan daya P yang terkecil diperlukan untuk menggerakkan baji C ke kiri. Abaikan berat baji-baji tersebut.

(17 markah)

PART A : ANSWER ALL QUESTIONS

S1 (a) Referring to **Figure S1 (a),**

(i) Show your plan on how you can obtain the centroid of the cross sectional shape using composite methods.

(ii) Locate the centroid ($\bar{x}$) of the cross sectional composite area.

(12 marks)

(b) Referring to **Figure S1 (b),** locate the centroid ($\bar{x}, \bar{y}$) of the composite area.

(8 marks)

S2 The lamp has mass 15 kg and is supported by pole AO and cables AB and AC, as shown in **Figure S2.** If the force in the pole acts along its axis and in equilibrium,

(a) Determine the forces in AO,

(b) Determine the forces in AB, and

(c) Determine the forces in AC.

(20 marks)

S3 **Figure S3** demonstrates a worker uses the hand trolley truck to move material down the ramp. If the truck and its contents are held in the position shown in **Figure S3,** and have a weight of W with center of gravity at G,

(a) Determine the resultant normal force of both wheels on the ground A, and

(b) Determine the magnitude of the force required at the grip B.

Given : W = 100 N, a = 0.3 m, b = 0.45 m, c = 0.6 m, d = 0.525 m, e = 0.45 m

f = 0.15 m, $\theta = 60°$, $\phi = 30°$.

(20 marks)

PART B : ANSWER TWO QUESTIONS ONLY

S4 (a) The force, F = 200 N acts on the gear in the direction as shown in **Figure S4 (a).** Thus, determine the moment of this force about the y axis.

(6 marks)

(b) If the tension given in the cable at panel is F = 700 N as shows in **Figure S4 (b),** determine the magnitude of the moment produced by this force about the hinged axis CD.

(14 marks)

S5 The roof truss supports with vertical loading, F = 15 kN as shows in **Figure S5.**

(a) List all the zero force members for the roof truss.

(4 marks)

(b) Draw the Free Body Diagram (FBD) of the roof truss and FBD of selected part of the cut truss to solve question S5 (c).

(4 marks)

(c) Determine the force in members KJ, NJ and CD, and state if the members are in tension or compression.

(12 marks)

S6 (a) Explain what you understand about friction.

(3 marks)

(b) Referring to **Figure S6,** the static coefficient of friction between wedges B - C is μ_1 = 0.6 and between the surfaces of contact B – A and C – D, μ_2 = 0.4. If the spring is compressed 200 mm as in the position shown,

(i) Draw the Free Body Diagram (FBD) for wedge B and wedge C.

(ii) Determine the smallest force P needed to move wedge C to the left. Neglect the weight of the wedges.

(17 marks)

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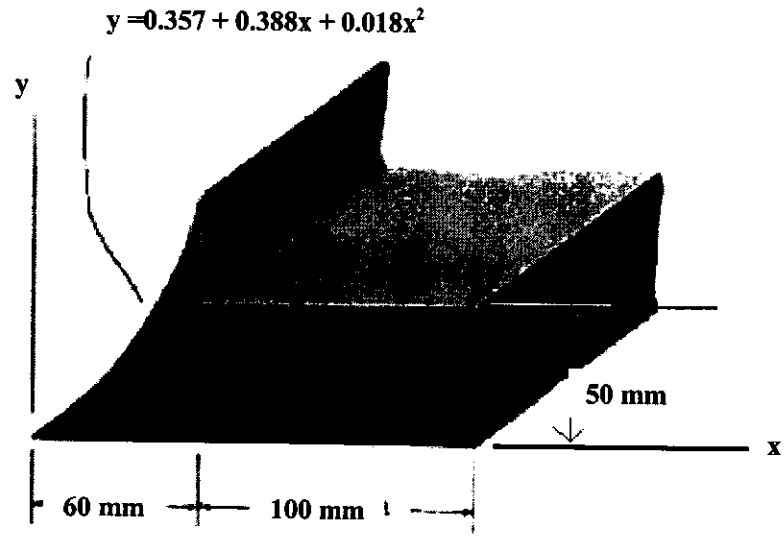
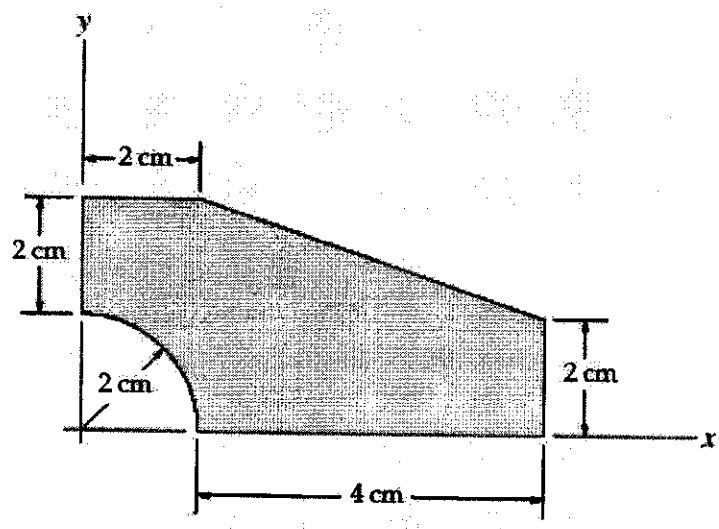


Rajah S1 (a) / Figure S1 (a)



Rajah S1 (b) / Figure S1 (b)

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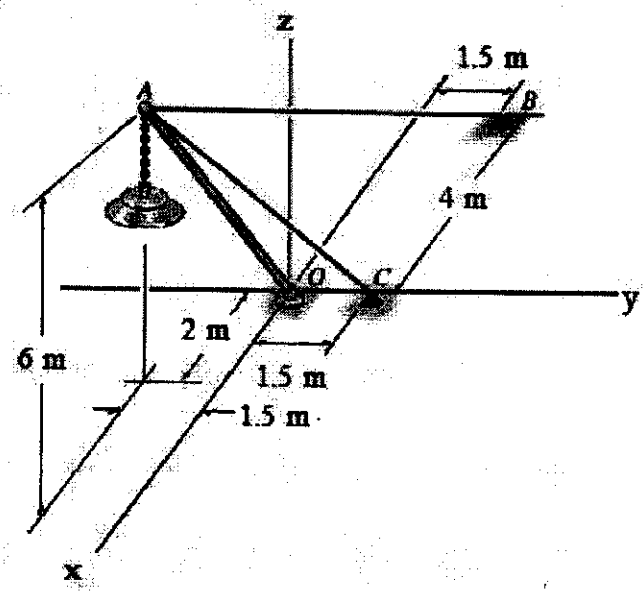
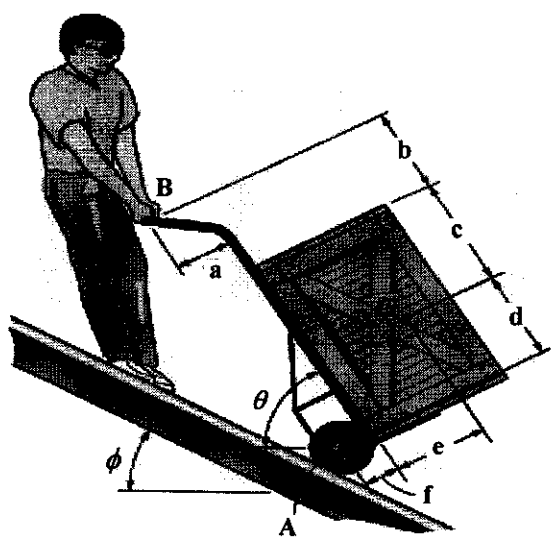


Rajah S2 / Figure S2



Rajah S3 / Figure S3

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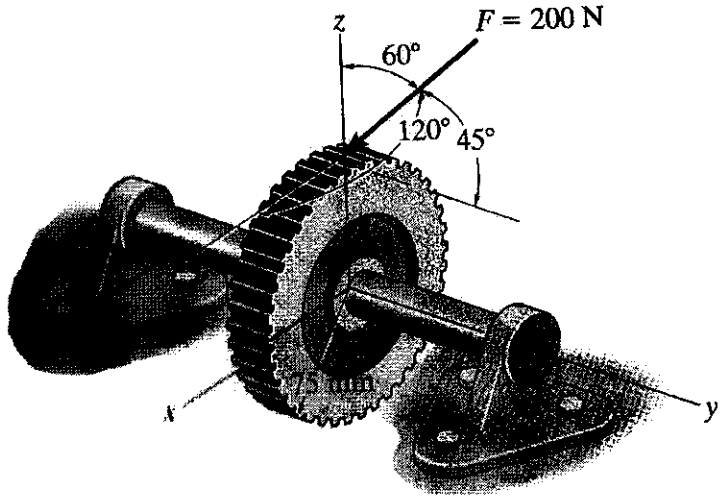
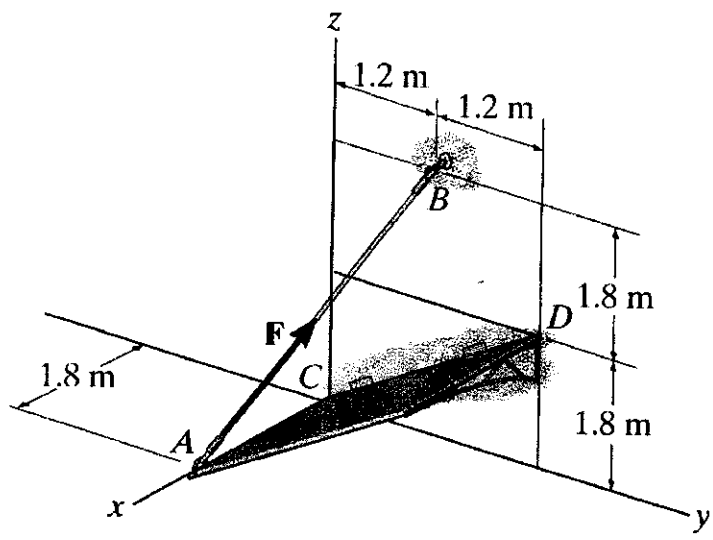


Rajah S4 (a) / Figure S4 (a)



Rajah S4 (b) / Figure S4 (b)

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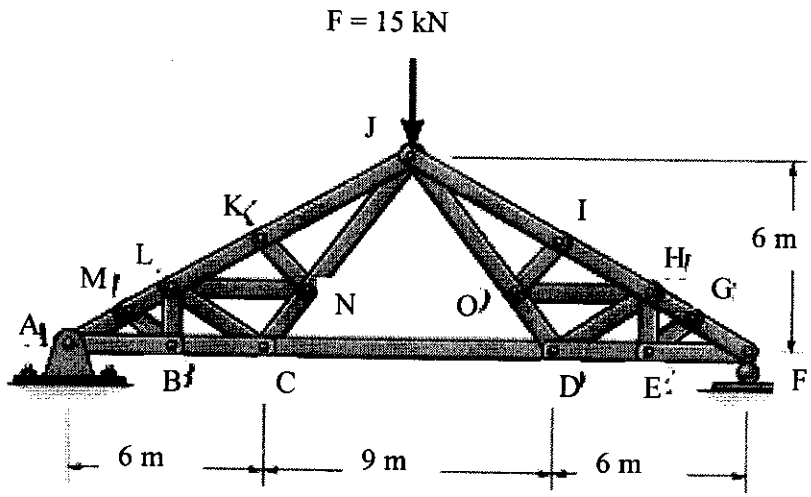
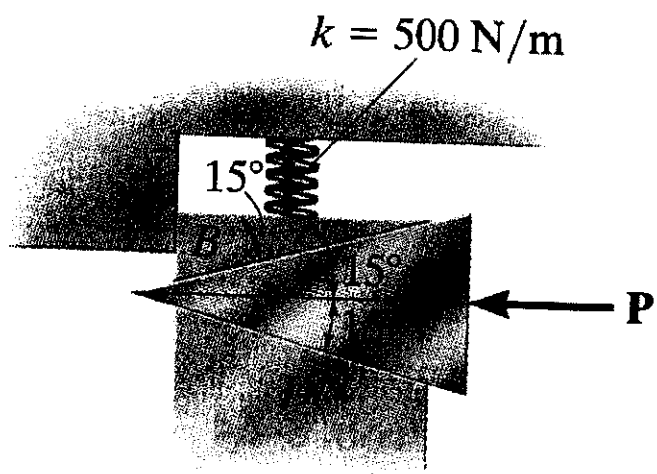


Rajah S5 / Figure S5



Rajah S6 / Figure S6

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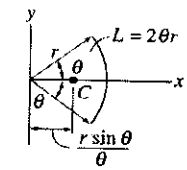
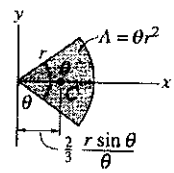
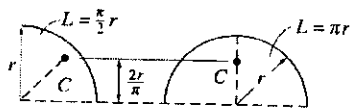
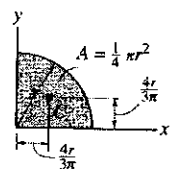
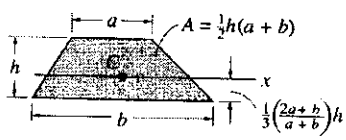
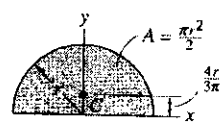
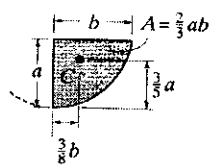
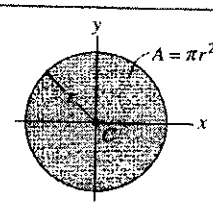
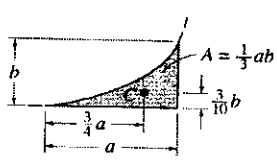
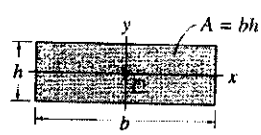
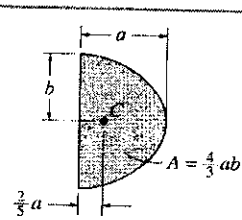
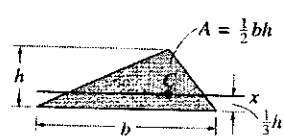
CENTROIDS OF COMMON SHAPES OF AREAS :

Centroid Location	Centroid Location	Area Moment of Inertia
 Circular arc segment	 Circular sector area	$I_x = \frac{1}{4}r^4(\theta - \frac{1}{2}\sin 2\theta$ $I_x = \frac{1}{4}r^4(\theta + \frac{1}{2}\sin 2\theta$
 Quarter and semicircle arcs	 Quarter circle area	$I_x = \frac{1}{16}\pi r^4$ $I_y = \frac{1}{16}\pi r^4$
 Trapezoidal area	 Semicircular area	$I_x = \frac{1}{8}\pi r^4$ $I_y = \frac{1}{8}\pi r^4$
 Semiparabolic area	 Circular area	$I_x = \frac{1}{4}\pi r^4$ $I_y = \frac{1}{4}\pi r^4$
 Exparabolic area	 Rectangular area	$I_x = \frac{1}{12}bh^3$ $I_y = \frac{1}{12}hb^3$
 Parabolic area	 Triangular area	$I_x = \frac{1}{36}bh^3$