SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2018

DBS1012: ENGINEERING SCIENCE

TARIKH : 18 APRIL 2019
MASA : 11.15 PAGI - 1.15 PETANG (2 JAM)

Kertas ini mengandungi **EMPAT BELAS (14)** halaman bercetak.

Struktur (6 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This section consists of **SIX (6)** structured questions. Answer **FOUR (4)** questions only.

ARAHAN:

*Bahagian ini mengandungi **ENAM (6)** soalan berstruktur. Jawab **EMPAT (4)** soalan sahaja.*

QUESTION 1

SOALAN 1

CLO1
C1

(a) Define scalar and vector quantity and give example for each.

Takrifkan kuantiti skalar dan vector dan beri contoh setiap satu.

[4 marks]

[*4 markah*]

CLO1
C2

(b) Determine the reading of the following measurement tools.

Tentukan nilai bacaan bagi alat pengukuran berikut.

i.

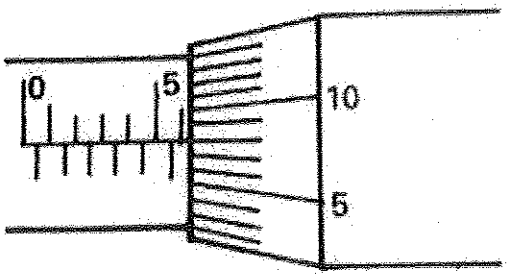

Figure 1b (i)/ *Rajah 1b (i)*

[3 marks]

[3 *markah*]

ii.

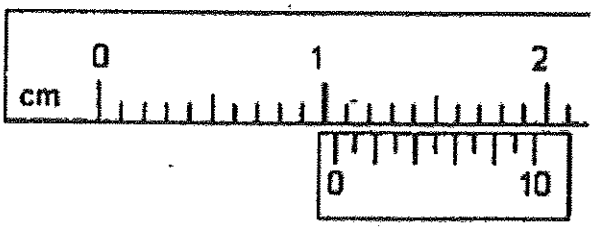

Figure 1b(ii)/ *Rajah 1b (ii)*

[3 marks]
[*3 markah*]

CLO3
C3

(c) Convert the following units:
Tukarkan unit berikut:

i. 8568 kg/m^3 to g/cm^3
8568 kg/m^3 kepada g/cm^3

[3 marks]
[*3 markah*]

ii. 670 km/h^2 to m/s^2
670 km/h^2 kepada m/s^2

[3 marks]
[*3 markah*]

iii. 24 g/mm^3 to kg/m^3
24 g/mm^3 kepada kg/m^3

[3 marks]
[*3 markah*]

iv. 45 mm/min to m/s
45 mm/min kepada m/s

[3 marks]
[*3 markah*]

v. 920 mm^2 to m^2

920 mm^2 kepada m^2

[3 marks]

[*3 markah*]

QUESTION 2

SOALAN 2

CLO1 C1

(a) Define the following terms and state the SI units:

Berikan definisi dan nyatakan unit SI bagi istilah berikut:

i. Displacement

Sesaran

[2 marks]

[*2 markah*]

ii. Acceleration

Pecutan

[2 marks]

[*2 markah*]

CLO1 C2

(b) Give **THREE (3)** differences between speed and velocity.

*Berikan **TIGA (3)** perbezaan di antara laju dan halaju.*

[6 marks]

[*6 markah*]

CLO3
C3

(c) A car that starts to move from point A needs to go through points B and C before it reaches point D. The time taken to move from point A to B is 20 seconds, until it reaches velocity of 30m/s. Then it moves from point B to C in 30 seconds, until its velocity becomes 55 m/s. However, during the last 10 seconds, the car decelerates until it stops at point D.

Sebuah kereta mula bergerak dari titik A perlu melalui titik B dan C sebelum sampai ke titik D. Masa diambil untuk bergerak dari titik A ke B adalah 20 saat, sehingga ia mencapai halaju 30m/s. Kemudian ia bergerak dari titik B ke C dalam masa 30 saat, sehingga halajunya menjadi 55 m/s. Bagi 10 saat terakhir, kereta itu menjadi perlahan sehingga ia berhenti di titik D.

i. Calculate the time taken for the car to reach maximum velocity.
Kirakan masa kereta tersebut mencapai halaju maksimum.

[2 marks]
[*2 markah*]

ii. Sketch a velocity-time graph for that car.
Lakarkan graf halaju-masa bagi kereta itu.

[5 marks]
[*5 markah*]

iii. Calculate acceleration from point B to C.
Kira pecutan dari titik B ke C.

[3 marks]
[*3 markah*]

iv. From the velocity-time graph, determine the total distance.
Daripada graf halaju-masa, tentukan jumlah jarak yang dilalui.

[5 marks]
[*5 markah*]

QUESTION 3

SOALAN 3

CLO1 C1 (a) i. State the definition and SI unit of Force.

Nyatakan definisi dan SI unit bagi Force.

[2 marks]

[*2 markah*]

ii. State **TWO (2)** effects of force in everyday life.

*Nyatakan **DUA (2)** kesan daya dalam kehidupan harian.*

[2 marks]

[*2 markah*]

CLO1 C2 (b) i. A force of 100N is applied to an object of 15 kg mass on a flat surface. Find its acceleration.

Satu daya 100 N dikenakan pada objek yang berjisim 15 kg di atas permukaan yang rata. Cari pecutan yang terhasil.

[2 marks]

[*2 markah*]

ii. Calculate the net force acting on the x-axis and y-axis of an object in Figure 3b(ii).

Kirakan daya bersih bertindak pada paksi-x dan paksi-y bagi objek dalam Rajah 3b(ii).

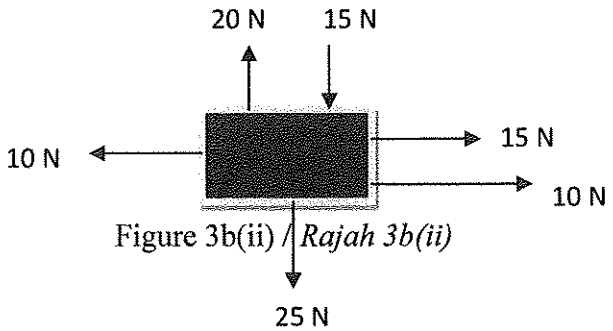

Figure 3b(ii) / *Rajah 3b(ii)*

[4 marks]

[*4 markah*]

CLO3
C3

(c) i. Calculate the resultant force and determine its direction for Figure 3c(i).

Kira daya paduan dan tentukan arah bagi Rajah 3c(i).

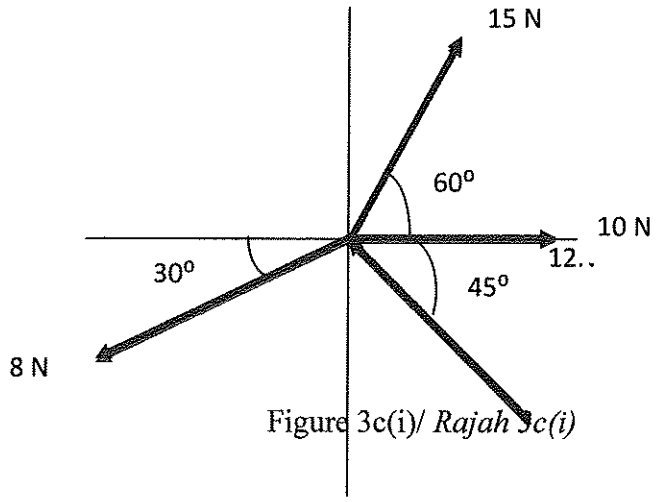

Figure 3c(i)/ *Rajah 3c(i)*

[9 marks]

[*9 markah*]

ii. Figure 3c(ii) shows a loaded beam. Find the distance of x from point A to keep the beam in equilibrium.

Rajah 3c(ii) menunjukkan rasuk yang dikenakan beban. Kirakan jarak x dari titik A supaya rasuk berada dalam keadaan seimbang.

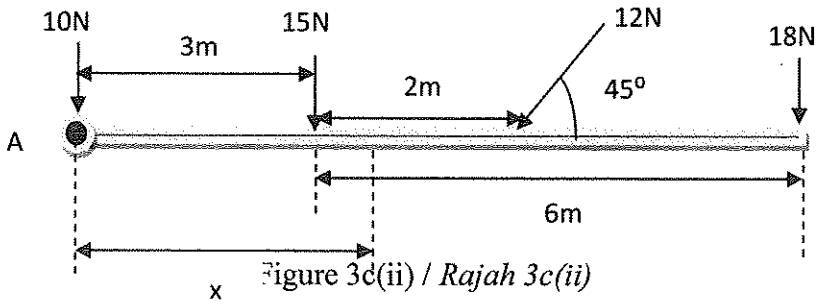

Figure 3c(ii) / *Rajah 3c(ii)*

[6 marks]

[*6 markah*]

QUESTION 4

SOALAN 4

CLO1
C1

(a) i. Define and state the SI unit of Power.
Nyatakan definisi dan unit SI untuk Kuasa.

[2 marks]
[*2 markah*]

ii. State **TWO (2)** principles of conservation of energy.
*Nyatakan **DUA (2)** prinsip keabadian tenaga.*

[2 marks]
[*2 markah*]

CLO1
C2

(b) An elevator lifts a 505 kg box at a height of 22 m at a velocity of 4m/s. Calculate:
Sebuah lif mengangkat kotak 505 kg pada ketinggian 22 m dengan halaju 4m/s. Kirakan:

i. Work done by the elevator.
Kerja yang dilakukan oleh lif.

[4 marks]
[*4 markah*]

ii. Power exerts by the elevator during the trip.
Kuasa yang dihasilkan semasa perjalanan.

[2 marks]
[*2 markah*]

CLO3
C3

c) i. At Semariang Theme Park, Azman who has a mass of 74kg rides on a rollercoaster as shown in Figure 4c(i). Calculate:

Di Taman Tema Semariang, Azman yang mempunyai jisim 74kg, bermain rollercoaster seperti Rajah 4c(i). Kirakan:

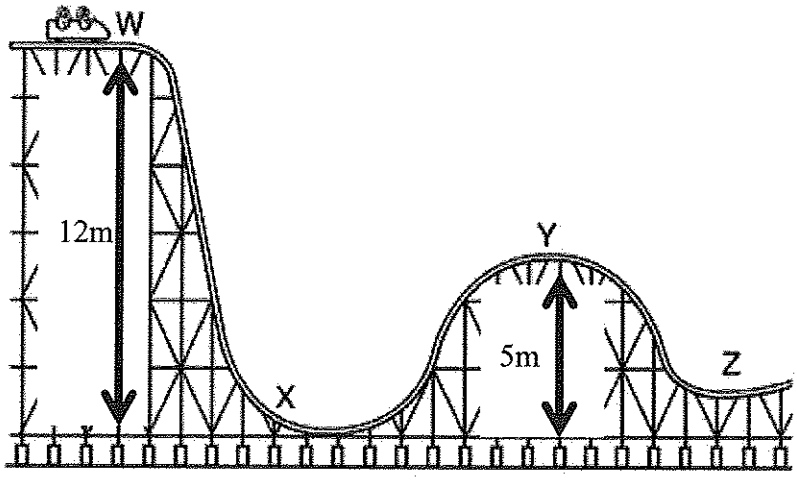

Figure 4c(i) / *Rajah 4c(i)*

a. Total energy at W.
Jumlah tenaga di W.

[2 marks]
[*2 markah*]

b. Kinetic energy at X.
Tenaga kinetic di X.

[2 marks]
[*2 markah*]

c. Kinetic energy and potential energy at Y.
Tenaga kinetik dan tenaga keupayaan di Y.

[5 marks]
[*5 markah*]

ii. An electric motor has an input power which consumed 0.055kW. The motor was activated for 1 minute and produced 3142 J. Find the efficiency of the motor.

Motor elektrik mempunyai kuasa input yang menggunakan 0.055kW. Motor ini telah diaktifkan untuk 1 minit dan menghasilkan 3142 J. Tentukan kecekapan motor.

[6 marks]
[*6 markah*]

QUESTION 5
SOALAN 5

CLO 1
C1

(a) Give **TWO (2)** characteristics for each of the following:
*Berikan **DUA (2)** ciri bagi setiap yang berikut:*

i. Solid
Pepejal

[2 marks]
[*2 markah*]

ii. Liquid
Cecair

[2 marks]
[*2 markah*]

CLO 1
C2

(b) A metal block with density of 750 kg/m^3 is located on a floor. The weight of the metal block is 1500 N. Calculate:
(Given g=9.81m/s^2)

Sebuah bongkah besi berketumpatan 750 kg/m^3 diletakkan di atas lantai. Berat bongkah besi tersebut ialah 1500 N. Kirakan:
(Diberi g=9.81 m/s^2)

i. mass of the metal block
jisim bongkah besi

[2 marks]
[*2 markah*]

ii. volume of the metal block
isipadu bongkah besi

[2 marks]
[*2 markah*]

iii. relative density of the metal block
ketumpatan bandingan bongkah besi

[2 marks]
[*2 markah*]

CLO 3
C3

(c) i. A large piston of a hydraulic jack in Figure 5c(i) has a cross-sectional area of $0.5m^2$ and the small piston has a cross-sectional area of 0.02 m^2. The upward force for lifting a load place on top of the large piston is 7000N.

Piston besar sebuah jek hidraulik pada Rajah 5c(i) mempunyai luas keratan Rentas $0.5m^2$ dan piston kecil mempunyai luas keratan rentas 0.02 m^2. *Daya keatas untuk mengangkat beban pada bahagian atas piston besar ialah 7000N.*

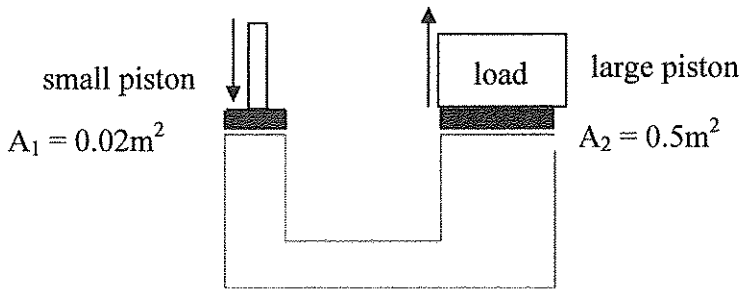

Figure 5c(i) / *Rajah 5c(i)*

a. Calculate the downward force on the small piston.
Kirakan daya kebawah pada bahagian piston kecil.

[4 marks]
[*4 markah*]

b. If the distance moved by the small piston is 150cm, what is the distance moved by the large piston.
Jika jarak pergerakan pada piston kecil ialah 150cm, berapakah jarak pergerakan pada piston besar.

[5 marks]
[5 *markah*]

ii. A cuboid with density of 1500 kg/m^3 and volume of 800 cm^3 is immerged in water. (Given g=9.81m/s^2). Calculate the actual weight of the cuboid.

Sebuah kuboid dengan ketumpatan 1500 kg/m^3 dan berisipadu 800 cm^3 telah tenggelam di dalam air. (Diberi g=9.81 m/s^2). Kirakan berat sebenar kuboid.

[6 marks]
[*6 markah*]

QUESTION 6
SOALAN 6

CLO1 C1 (a) Give **TWO (2)** differences between temperature and heat.
*Berikan **DUA (2)** perbezaan antara suhu dan haba.*

[4marks]
[*4 markah*]

CLO1 C2 (b) State and explain **THREE (3)** processes of heat transferred
*Nyatakan dan terangkan **TIGA (3)** proses pemindahan haba.*

[6 marks]
[*6 markah*]

CLO3 C3 (c) i. Calculate the initial temperature of 3.2kg of water if 500000J of heat is required to raise the temperature until it reaches 100°C.
(Specific heat capacity of water: 4.2kJ/kg°C)

Kira suhu awal 3.2kg jika air 500000J haba yang diperlukan untuk menaikkan suhu sehingga mencecah 100°C.
(Muatan haba tentu air: 4.2kJ / kg°C)

[5 marks]
[*5 markah*]

ii. 500 g sand with temperature of 120^0C is put into the 100 g aluminum container that has initial temperature of 30^0C. Find the final temperature if there is no heat lost to the surrounding during that process.
(Specific heat capacity of sand: 290J/kg^0C)
(specific heat capacity of aluminium: 700J/kg^0C)

500 g pasir dengan suhu 120^0C dimasukkan ke dalam bekas aluminium seberat 100 g yang mempunyai suhu awal 30^0C . Cari suhu akhir jika tiada kehilangan haba ke persekitaran semasa proses itu berlaku.
(Muatan haba tentu pasir: 290J / kg^0C)
(Haba muatan aluminium: 700J / kg^0C

[10 marks]
[*10 markah*]

SOALAN TAMAT

FORMULA DBS1012 ENGINEERING SCIENCE	
$g = 9.81\ m/s^2$	$W = Fs$
$W = mg$	$W = Fs\cos\theta$
$v = u + at$	$P = \frac{W}{t}$
$s = ut + \frac{1}{2}at^2$	$P = Fv$
$s = \frac{1}{2}(u + v)t$	$\rho = \frac{m}{V}$
$v^2 = u^2 + 2as$	$\rho_{relative} = \frac{\rho_{substance}}{\rho_{water}}$
$F = ma$	$P = \frac{F}{A}$
$F = mg\sin\theta$	$P_{liquid} = \rho gh$
$F_x = F\cos\theta$	$\frac{F_1}{A_1} = \frac{F_2}{A_2}$
$F_y = F\sin\theta$	$A_1h_1 = A_2h_2$
$F_R = \sqrt{(\sum F_x)^2 + (\sum F_y)^2}$	$F_B = \rho Vg$
$\theta = \tan^{-1}\left(\frac{\sum F_y}{\sum F_x}\right)$	$Q = mc\theta$
$M = Fd$	$C_{water} = 4{,}200\ J/kg°C$
$E_p = mgh$	$\rho_{water} = 1{,}000 kg/m^3$
$E_k = \frac{1}{2}mv^2$	$Efficiency = \frac{P_{out}}{P_{in}} \times 100\%$