SULIT

POLITEKNIK MALAYSIA

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2019

DBS10012 : ENGINEERING SCIENCE

TARIKH : 04 NOVEMBER 2019
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **TIGA BELAS (13)** halaman bercetak.
Subjektif (4 soalan)
Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This section consists of **FOUR (4)** subjective questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan subjektif. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1
C1

a) i. Define derived quantities and base quantities.

Takrifkan kuantiti terbitan dan kuantiti asas.

[2 marks]

[*2 markah*]

ii. Give **THREE (3)** examples of scalar quantities.

*Berikan **TIGA (3)** contoh kuantiti skalar.*

[3 marks]

[*3 markah*]

CLO 1
C3

b) Convert the following units:

Tukarkan unit berikut:

i. 10.2 km to m.

10.2 km kepada m.

[2 marks]

[*2 markah*]

ii. 300 kg/m^3 to g/cm^3.

300 kg/m^3 kepada g/cm.^{3}

[3 marks]

[*3 markah*]

CLO1
C3

c) i. A motorcycle starts in a state of rest and accelerates at 10.23 m/s^2 for 5.5 seconds. Calculate the distance traveled by the motorcycle.

Sebuah motosikal bermula dalam keadaan rehat dan memecut pada 10.23 m/s^2 selama 5.5 saat. Kira jarak yang telah dilalui oleh motosikal tersebut.

[2 marks]
[*2 markah*]

ii. Calculate the acceleration of a car that moves from rest and achieves a velocity of 120 km/h in 20 minutes.

Kirakan pecutan sebuah kereta yang bergerak dari keadaan rehat dan mencapai halaju 120 km/j dalam masa 20 minit.

[4 marks]
[*4 markah*]

CLO1
C3

d) The velocity of a lorry travelling along a straight road decreases uniformly from 14 m/s to 8 m/s for 88 m before it stops.

Halaju sebuah lori yang bergerak pada jalan yang lurus menurun secara seragam daripada 14 m/s ke 8 m/s sejauh 88 m sebelum ia berhenti.

i. Sketch the velocity-time graph for motion of the lorry.
Lakarkan graf halaju melawan masa bagi pergerakan lori tersebut.

[4 marks]
[*4 markah*]

ii. From the graph, calculate the time taken for the lorry to decrease its velocity from 14 m/s to 8 m/s.
Daripada graf, kira masa yang diambil oleh lori tersebut untuk menurunkan halajunya daripada 14 m/s kepada 8 m/s.

[3 marks]
[*3 markah*]

iii. Calculate the deceleration of the lorry.
Kira nyahpecutan lori tersebut.

[2 marks]
[*2 markah*]

QUESTION 2

SOALAN 2

CLO1 C3

a) Calculate the reaction force at point A and B in Figure 2 (a) below.
Kirakan daya tindak balas pada titik A dan titik B dalam Rajah 2 (a) di bawah.

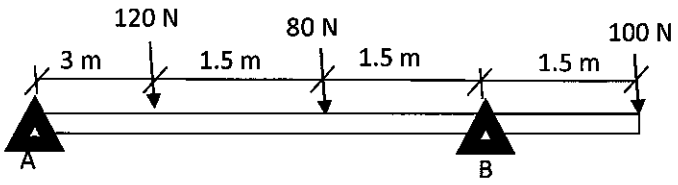


Figure 2 (a) / *Rajah 2 (a)*

[8 marks]
[*8 markah*]

CLO1 C2

b) Table 2 (b) shows the masses and velocities of two boys, Ariff and Benneth. Which of the boys has greater kinetic energy?

Jadual 2 (b) menunjukkan jisim dan halaju bagi dua orang budak lelaki, Ariff dan Benneth. Siapakah yang menghasilkan tenaga kinetik yang lebih tinggi?

Table 2 (b) / *Jadual 2 (b)*

Boy	Mass / kg	Velocity / ms^{-1}
Ariff	95	4.8
Benneth	48	9.5

[4 marks]
[*4 markah*]

CLO1
C3

c) Figure 2 (c) shows a child on a swing. The mass of the child is 35 kg. The swing is raised to point A and then released. She swings downwards through the equilibrium position at point B.

Rajah 2 (c) menunjukkan seorang kanak-kanak di atas buaian. Jisim kanak-kanak ini adalah 35 kg. Buaian ini telah dinaikkan sehingga ke titik A dan kemudian dilepaskan ke bawah sehingga melalui kedudukan keseimbangan di titik B.

i. Calculate the loss in gravitational potential energy of the child between A and B.
Kirakan tenaga keupayaan graviti yang dilepaskan oleh kanak-kanak ini di antara titik A dan B.

[2 marks]
[*2 markah*]

ii. Assuming that the air resistance is negligible, calculate the speed of the child as she passes through equilibrium position at point B.
Dengan mengabaikan rintangan udara, kirakan laju semasa dia melalui kedudukan seimbang di titik B.

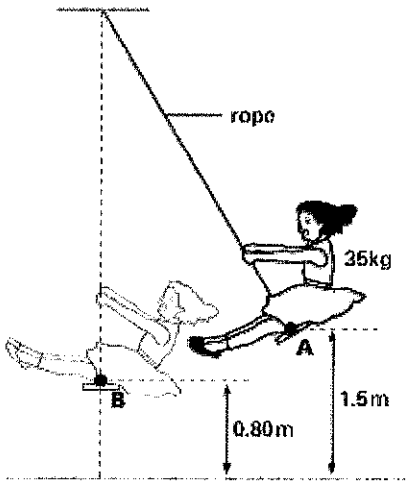


Figure 2 (c) / *Rajah 2 (c)*

[3 marks]
[*3 markah*]

CLO1
C3

d) A ball with a mass of 800 g is dropped from a height of 5.0 m and rebounds to a height of 3.8 m. The air resistance is negligible. Calculate:

Sebiji bola dengan jisim 800 g dilepaskan dari ketinggian 5.0 m dan melantun setinggi 3.8 m. Abaikan rintangan udara yang berlaku. Kirakan:

i. The kinetic energy of the ball just before the impact.
Tenaga kinetik bola tersebut sebelum melantun.

[2 marks]
[*2 markah*]

ii. The initial rebound speed of the ball.
Halaju awal semasa bola mula melantun.

[5 marks]
[*5 markah*]

iii. The energy transferred to the ground during the impact.
Tenaga yang dipindahkan ke tanah semasa lantunan berlaku.

[1 mark]
[*1 markah*]

QUESTION 3

SOALAN 3

CLO1
C1

a) i. State the definition and SI units for density and pressure.

Berikan takrifan dan unit SI bagi ketumpatan dan tekanan.

[4 marks]

[*4 markah*]

ii. List **TWO (2)** characteristics of pressure in fluids.

*Senaraikan **DUA (2)** ciri-ciri tekanan dalam bendalir.*

[2 marks]

[*2 markah*]

CLO1
C3

b) A block of 250 cm × 200 cm × 4 m has a weight of 450 N. Calculate the density and relative density of the block.
(Given density of water = 1000 kgm^{-3}, gravity = 9.81 ms^{-2})

Satu blok berukuran 250 cm ×200 cm × 4 m mempunyai berat sebanyak 450 N. Kirakan ketumpatan dan ketumpatan bandingan bagi blok tersebut.
(Diberi ketumpatan air = 1000 kgm^{-3}, graviti = 9.81 ms^{-2})

[6 marks]

[*6 markah*]

CLO1
C3

c) Based on the Figure 3 (c), the cylindrical piston of a hydraulic jack has a cross-sectional area of 0.17 m^2 and the plunger has a cross-sectional area of 0.012 m^2.

Berdasarkan Rajah 3 (c) yang di bawah, omboh silinder bagi jek hidraulik mempunyai luas keratan rentas 0.17 m^2 dan pelocoknya pula mempunyai luas keratan rentas 0.012 m^2.

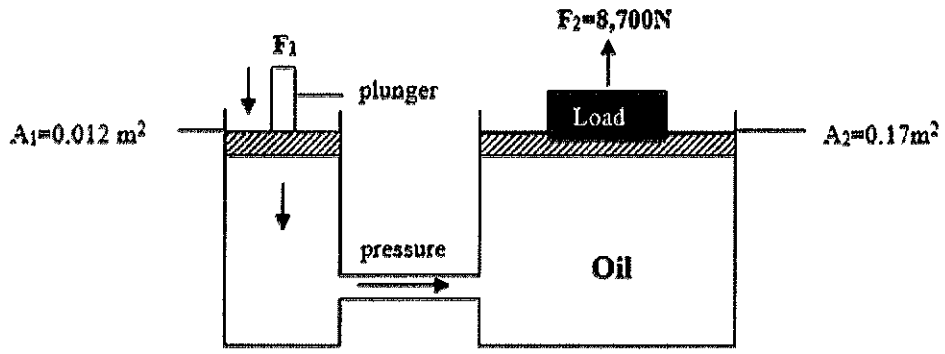


Figure 3 (c) / *Rajah 3 (c)*

i. The upward force for lifting a load placed on top of the large piston is 8,700 N. Calculate the downward force required on the plunger.

Daya ke atas untuk mengangkat beban yang diletakkan di atas omboh besar adalah 8,700 N. Kirakan daya ke bawah yang diperlukan oleh pelocok.

[3 marks]
[*3 markah*]

ii. If the distance moved by the plunger is 83 cm, calculate the distance in SI unit moved by the large piston.

Jika jarak yang digerakkan oleh pelocok adalah 83 cm, hitung jarak dalam unit SI yang telah dilalui oleh omboh besar?

[3 marks]
[3 *markah*]

CLO1
C3

d) A basketball floats in a bathtub of water. The basketball has a mass of 0.65 kg and a diameter of 24 cm. Calculate:
(Given gravity, $g = 9.81 ms^{-2}$ and $V_{sphere} = \frac{4}{3}\pi r^3$).

Sebiji bola keranjang terapung di dalam tab mandi berisi air. Jisim bola keranjang tersebut adalah 0.65kg dan berdiameter 24 cm. Kirakan:
(Diberi graviti, $g = 9.81 ms^{-2}$ and $V_{sfera} = \frac{4}{3}\pi r^3$).

i. The buoyant force
Daya tujahan

[1 mark]
[*1 markah*]

ii. The volume of water displaced by the basketball.
Isipadu air yang telah disesarkan oleh bola keranjang tersebut.

[3 marks]
[*3 markah*]

iii. The density of the basketball.
Ketumpatan bola keranjang tersebut.

[3 marks]
[*3 markah*]

QUESTION 4

SOALAN 4

CLO1
C1

a) State the definition and SI unit for the terms below:
Nyatakan definisi dan unit SI bagi sebutan di bawah:

i. Temperature
Suhu

[2 marks]
[*2 markah*]

ii. Heat
Haba

[2 marks]
[*2 markah*]

iii. Specific heat capacity
Muatan haba tentu

[2 marks]
[*2 markah*]

CLO1 C2

b) Describe **TWO (2)** characteristics of heat transfer process for:
*Terangkan **DUA (2)** ciri-ciri proses pemindahan haba bagi:*

i. Conduction
Konduksi

[2 marks]
[*2 markah*]

ii. Convection
Perolakan

[2 marks]
[*2 markah*]

iii. Radiation
Radiasi

[2 marks]
[*2 markah*]

CLO1 C3

c) Calculate:
Kirakan:

i. 1 kg of wood sample is heated at 40 kJ, and its temperature is found to rise from 20 °C to 44 °C. What is the specific heat capacity of the wood?

1 kg sampel kayu dikenakan 40 kJ haba, dan didapati suhu kayu tersebut meningkat dari 20 °C kepada 44 °C. Apakah muatan haba tentu kayu tersebut?

[3 marks]
[*3 markah*]

ii. The mass of water at 50 °C is needed to melt 2.2 kg of ice at 0°C.
(Given specific latent heat of ice, L = 3.34 x 10^5 J/k)

Jisim air pada suhu 50°C yang diperlukan untuk mencairkan 2.2 kg ais pada 0°C. (Diberi haba pendam ais, L = 3.34 x 10^5 J/k)

[2 marks]
[*2 markah*]

CLO1
C3

d) 0.5 kg of water at 60 °C is mixed with *m* kg of water at 15 °C. The final temperature of the mixture is 55 °C.
(Given Specific heat capacity of water, c= 4200 $Jkg^{-1}°C^{-1}$).

0.5 kg air pada suhu 60 °C dicampurkan dengan m kg air pada suhu 15 °C. Suhu akhir campuran air tersebut ialah 55 °C.
(Diberi Muatan haba tentu air, c = 4200 $Jkg^{-1}°C^{-1}$).

i. Construct a table to compare Q_{hot} and Q_{cold}.
Bina jadual perbandingan bagi Q_{panas} and Q_{sejuk}.

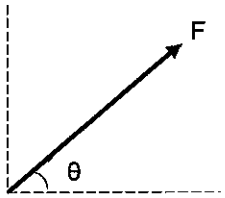
[3 marks]
[*3 markah*]

ii. Calculate the value of *m*
Kirakan nilai m

[5 marks]
[*5 markah*]

SOALAN TAMAT

FORMULA DBS10012
ENGINEERING SCIENCE

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

Length, Area, Mass and Volume Conversion

Length		
1 inch (in)		2.54 centimeters (cm)
1 foot (ft)	12 inches (in)	30.48 centimetres (cm)
1 yard (yd)	3 feets (ft)	0.9144 metre (m)
1 mile (mi)	1,760 yards (yd)	1.60934 kilometres (km)
Area		
1 in^2		6.4516 cm^2
1 ft^2		0.09 m^2
1 yd^2	9 ft^2	0.8361 m^2
1 acre	4,840 yd^2	4046.86 m^2 / 0.405 hectare
1 $mile^2$	640 acres	2.590 km^2
Mass (weight)		
1 ounce (oz)		28.35 grams (g)
1 pound (lb)		453.59 grams (g)
Volume		
1 gallons (gal)		3.8 liters (L)
1 ft^3		0.03 m^3
1 yd^3		0.76 m^3

Temperature Conversion

Temperature	
Convert Fahrenheit (F) to Celcius (C)	(degrees F – 32) x 0.555
Convert Celcius (C) to Fahrenheit (F)	(degrees C x 1.8) + 32