SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI II : 2024/2025

DBS10042 : ENGINEERING SCIENCE

TARIKH : 23 MEI 2025
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

Struktur (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)** questions. Answers **ALL** questions.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1 (a) i. Define scalar quantity and vector quantity.

Takrifkan kuantiti skala dan kuantiti vektor.

[2 marks]

[*2 markah*]

ii. List **TWO (2)** characteristics of distance and displacement.

*Senaraikan **DUA (2)** ciri-ciri bagi jarak dan sesaran.*

[4 marks]

[*4 markah*]

CLO1 (b) Change the following units:

Tukarkan unit berikut:

i. 210 cm^2 to m^2.

210 cm^2 kepada m^2.

[3 marks]

[*3 markah*]

ii. 0.045 ms^{-1} to kmh^{-1}.

0.045 ms^{-1} kepada kmh^{-1}.

[3 marks]

[*3 markah*]

iii. Calculate the actual reading for the tool below if zero error is 0.01 mm in Figure 1(b)(iii).
Kirakan nilai bacaan sebenar bagi peralatan di bawah jika nilai ralat sifar adalah 0.01 mm dalam Rajah 1(b)(iii).

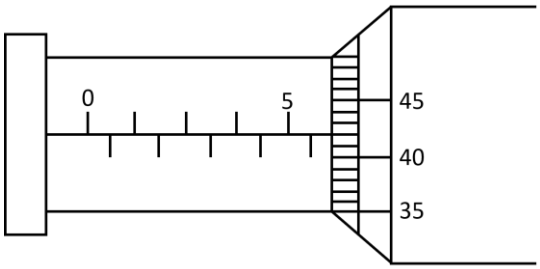


Figure 1(b)(iii) / Rajah 1(b)(iii)

[4 marks]
[*4 markah*]

CLO1 (c) i. A car is accelerated at 8 ms^{-2} from initial velocity of 50 ms^{-1} for 110 seconds. Calculate the final velocity of the car.
Sebuah kereta memecut dengan pecutan 8 ms^{-2} dari halaju awal 50 ms^{-1} selama 110 saat. Kirakan halaju akhir kereta tersebut.

[4 marks]
[*4 markah*]

ii. Figure 1(c)(ii) shows the velocity-time graph of the motion of a motorcycle on a straight road. Calculate the initial acceleration and the total distance taken by the motorcycle.

Rajah 1(c)(ii) menunjukkan graf halaju-masa bagi pergerakan sebuah motosikal di atas jalan yang lurus. Kirakan pecutan awal dan jumlah jarak yang diambil oleh motosikal tersebut.

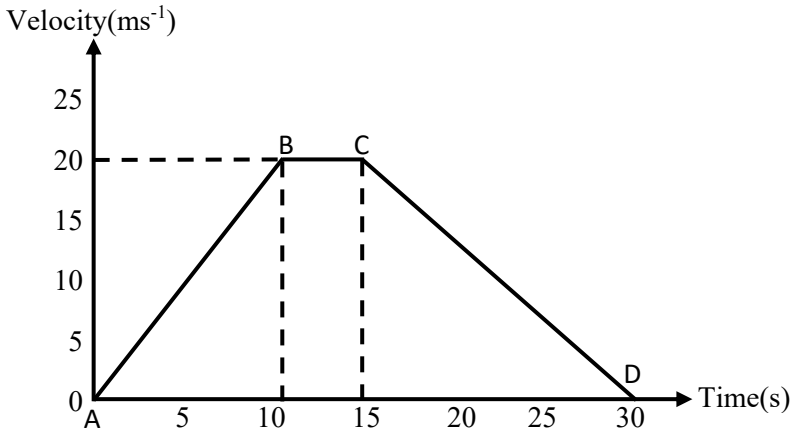


Figure 1(c)(ii) / Rajah 1(c)(ii)

[5 marks]

[*5 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) i. State the **definition** and **ONE (1)** example resource of **renewable energy** and **non-renewable energy**.

*Nyatakan definisi dan **SATU (1)** contoh sumber tenaga yang boleh diperbaharui dan sumber tenaga yang tidak boleh diperbaharui.*

[4 Marks]

[*4 Markah*]

ii. List **THREE (3)** principles of conservation of energy.

*Senaraikan **TIGA (3)** prinsip keabadian tenaga.*

[3 Marks]

[*3 Markah*]

CLO1 (b) i. A bag with mass of 2.5 kg is pulled upward through a stair. The height of each step is 0.15 m. Calculate the work done when pulling upward the bag through 20 steps of stairs.

Sebuah beg berjisim 2.5 kg ditarik ke atas melalui tangga. Ketinggian bagi setiap anak tangga ialah 0.15 m. Kira kerja yang dilakukan apabila menarik beg melalui 20 anak tangga.

[4 Marks]

[*4 Markah*]

ii. A cat with a mass of 3 kg is sitting on a tree limb 4 m above the ground. Calculate the potential energy and kinetic energy when it jumps 1.8 m to the ground.

Seekor kucing dengan jisim 3 kg sedang duduk di dahan pokok pada ketinggian 4 m dari tanah. Kirakan tenaga keupayaan dan tenaga kinetik apabila ia melompat 1.8 m ke tanah.

[6 Marks]

[*6 Markah*]

CLO1

(c) A piano with a mass of 250 kg is being lifted to a window located 15 m above the floor using a system of pulleys and a diesel motor. Calculate the:
Sebuah piano berjisim 250 kg diangkat ke tingkap yang berada 15 m daripada lantai menggunakan sistem takal dan motor diesel. Kirakan:

i. Time taken if the motor has a power output of 700 W to lift the piano to the window.
Masa yang diambil jika motor tersebut mempunyai kuasa output 700 W bagi mengangkat piano ke tingkap.

[4 Marks]
[*4 Markah*]

ii. Energy input by the diesel motor during the lift if its efficiency is 30 %.
Tenaga input oleh motor diesel semasa diangkat sekiranya kecekapan motor diesel ialah 30 %.

[4 Marks]
[*4 Markah*]

QUESTION 3

SOALAN 3

CLO1 (a) i. State the definition and SI unit for density.

Nyatakan takrifan dan unit SI bagi ketumpatan.

[2 Marks]

[*2 Markah*]

ii. List **THREE (3)** characteristics of solid and liquid.

*Senaraikan **TIGA (3)** ciri-ciri pepejal dan cecair.*

[6 Marks]

[*6 Markah*]

CLO1 (b)

Table 3(b)(i) / *Jadual 3(b)(i)*

	X	Y
Mass	560kg	820kg
Volume	$0.42m^3$	$0.35\ m^3$

i. Table 3(b)(i) shows two types of liquids X and Y. Calculate the relative density of liquids X and Y.

Jadual di atas menunjukkan dua jenis cecair X dan Y. Kirakan ketumpatan relatif bagi cecair X dan Y tersebut.

[6 Marks]

[*6 Markah*]

ii. An elephant has a weight of 50000 N. Each foot of the elephant has an area of 0.5 m². Calculate the pressure exerted by the elephant on the ground if it stands on all four (4) feet.

Seekor gajah mempunyai berat 50000 N. Setiap kaki gajah mempunyai keluasan 0.5 m². Kira tekanan yang dikenakan oleh gajah ke atas tanah jika ia berdiri di atas keempat-empat (4) kakinya.

[3 Marks]

[*3 Markah*]

CLO1 (c)

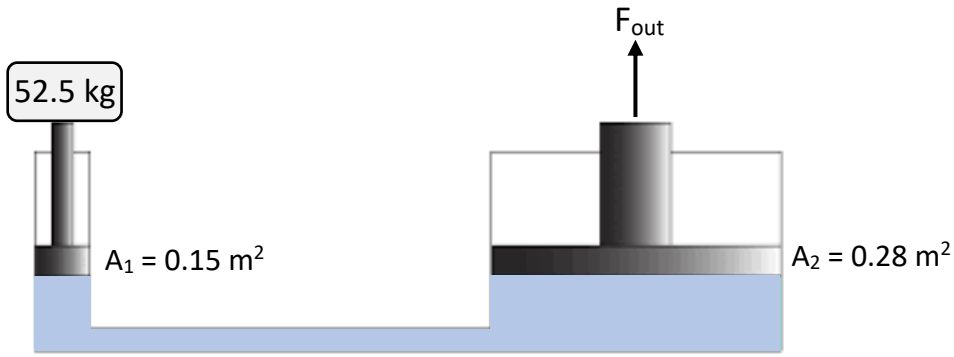


Figure 3(c) shows a simple hydraulic system. If 52.5 kg load is placed on a small piston, calculate:

Rajah 3(c) menunjukkan sistem hidraulik mudah. Jika 52.5 kg beban diletakkan di atas sebuah omboh kecil, kirakan:

i. Output force, F_{out} on the large piston.
Daya keluar, F_{out} pada omboh besar.

[6 Marks]
[*6 Markah*]

ii. Pressure transmitted from small piston to large piston.
Tekanan yang dipindahkan dari omboh kecil ke omboh besar.

[2 Marks]
[*2 Markah*]

QUESTION 4

SOALAN 4

CLO1 (a) i. State the definition and SI unit for latent heat.
Nyatakan takrifan dan unit SI bagi haba pendam.

[2 Marks]
[*2 Markah*]

ii. List **THREE (3)** ways of heat transfer with definition for each ways.
*Senaraikan **TIGA (3)** cara pemindahan haba beserta takrifan pada cara tersebut.*

[6 Marks]
[*6 Markah*]

CLO1 (b) i. A calorimeter has a heat capacity of 1355 J/°C. A reaction causes the temperature of the calorimeter to change from 40 °C to 16 °C. Calculate the heat released in this process.
Sebuah kalorimeter mempunyai kapasiti haba sebanyak 1355 J/°C. Suatu reaksi menyebabkan suhu kalorimeter berubah dari 40 °C ke 16 °C. Kirakan haba yang dilepaskan dalam proses ini.

[2 Marks]
[*2 Markah*]

ii. A 2.3 kg piece of aluminium is heated to a temperature of 41 °C. Calculate the initial temperature of the aluminium if 2800 J of heat is required to heat the aluminium.
(Specific heat capacity of aluminium = 900 J/kg°C)
Sekeping aluminium seberat 2.3 kg dipanaskan kepada suhu 41 °C. Kira suhu awal aluminium itu jika 2800 J haba diperlukan untuk memanaskan aluminium tersebut.
(Muatan haba tentu aluminium = 900 J/kg°C)

[3 Marks]
[*3 Markah*]

iii. Calculate the total energy required to change 0.2 kg of ice at 0 °C into water at 30 °C.
(Latent heat of fusion of water = 334000 J/kg , specific heat capacity of water = 4200 J/kg°C)
Kirakan jumlah tenaga yang diperlukan untuk mengubah 0.2 kg ais pada suhu 0 °C kepada air pada suhu 30 °C.
(Haba pendam pelakuran air = 334000 J/kg , muatan haba tentu air = 4200 J/kg°C)

[6 Marks]
[*6 Markah*]

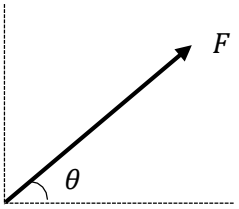
CLO1

(c) A cube of copper with mass of 0.5 kg and a temperature of 20 °C is added to 2.5 kg of water at 40 °C. Calculate the final temperature of the mixture if thermal equilibrium is achieved.
(Specific heat capacity of water = 4200 J/kg°C , specific heat capacity of copper = 400 J/kg°C)
Sebuah kubus tembaga dengan jisim 0.5 kg dan suhu 20 °C ditambahkan ke dalam 2.5 kg air yang bersuhu 40 °C. Kirakan suhu akhir campuran jika keseimbangan terma dicapai.
(Muatan haba tentu air = 4200 J/kg°C , muatan haba tentu tembaga = 400 J/kg°C)

[6 Marks]
[*6 Markah*]

SOALAN TAMAT

FORMULA DBS10012
ENGINEERING SCIENCE

$g = 9.81\ m/s^2$	$W = F \times d$
$w = mg$	$W = mgh$
$v = u + at$	$W = Fd\ cos\ \theta$
$s = ut + \frac{1}{2}at^2$	$F_x = F\ cos\ \theta$ $F_y = F\ sin\ \theta$  $F_R = \sqrt{\left(\sum F_x\right)^2 + \left(\sum F_y\right)^2}$ $\theta = tan^{-1}\left(\frac{F_y}{F_x}\right)$
$s = \frac{1}{2}(u + v)\ t$	
$v^2 = u^2 + 2as$	
$F = ma$	
$F_g = mg$	
$F = mg\ sin\ \theta$	$P = \frac{W}{t}$
$\rho = \frac{m}{V}$	$P = F \times v$
$\rho_{relative} = \frac{\rho_{subtance}}{\rho_{water}}$	$P = \rho gh$
$M = F \times d$	$P = \frac{F}{A}$
$E_p = mgh$	$\frac{F_1}{A_1} = \frac{F_2}{A_2}$
$E_k = \frac{1}{2}mv^2$	$A_1h_1 = A_2h_2$
$Efficiency = \frac{P_{output}}{P_{input}} \times 100\%$	$F_B = \rho Vg$
$Efficiency = \frac{E_{output}}{E_{input}} \times 100\%$	$Q = mc\Delta\theta$
$Efficiency = \frac{W_{output}}{W_{input}} \times 100\%$	$Q = mL$
$\rho_{water} = 1000\ kg/m^3$	$C_{water} = 4200\ J/kg℃$

Length, Area, Mass, and Volume Conversion

Length		
1 inch (in)		2.54 centimeter (cm)
1 foot (ft)	12 inches (in)	30.48 centimeter (cm)
1 yard (yd)	3 feets (ft)	0.9144 meter (m)
1 mile (mi)	1,760 yards (yd)	1.60934 kilometer (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 gallon (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 Celsius (C)	(degrees F – 32) x 0.555
Convert Celsius (C) to Fahrenheit (F)	(degrees C x 1.8) + 32