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

DBS10012 : 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)** structured questions. Answer **ALL** questions.

ARAHAN :

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

QUESTION 1

SOALAN 1

CLO1

(a) i. Define base quantity and derived quantity.

Takrifkan kuantiti asas dan kuantiti terbitan.

[2 marks]

[2 *markah*]

ii. Define velocity and acceleration and state their SI unit.

Takrifkan halaju dan pecutan serta nyatakan unit SI.

[4 marks]

[*4 markah*]

CLO1

(b) i. Convert the value of 23.5 g/cm^3 to kg/m^3

Tukarkan nilai 23.5 g/cm^3 kepada unit kg/m^3 .

[3 marks]

[3 *markah*]

ii. Figure 1b (ii) shows the reading of the vernier caliper. Find the zero error and the corrected readings of the vernier caliper.
Rajah 1b (ii) menunjukkan bacaan angkup vernier. Cari nilai zero error dan bacaan sebenar angkup vernier yang ditunjukkan dalam rajah tersebut.

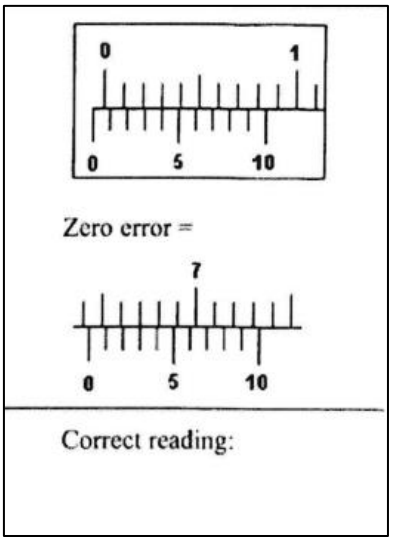


Figure 1b (ii) / *Rajah 1b (ii)*

[3 marks]
[3 *markah*]

iii. A car accelerates at 2.5 ms^{-2} from an initial velocity of 19 ms^{-1} for 1.6 minutes. Calculate the final velocity of the car.
Sebuah kereta memecut dengan pecutan 2.5 ms^{-2} dengan halaju awal 19 ms^{-1} selama 1.6 minit. Kirakan halaju akhir kereta tersebut.

[3 marks]
[3 *markah*]

CLO1

(c) Figure 1 (c) shows the velocity-time graph of the motion of a car on a straight road.

Rajah 1 (c) di bawah menunjukkan graf halaju-masa bagi pergerakan sebuah kereta di atas suatu jalan yang lurus.

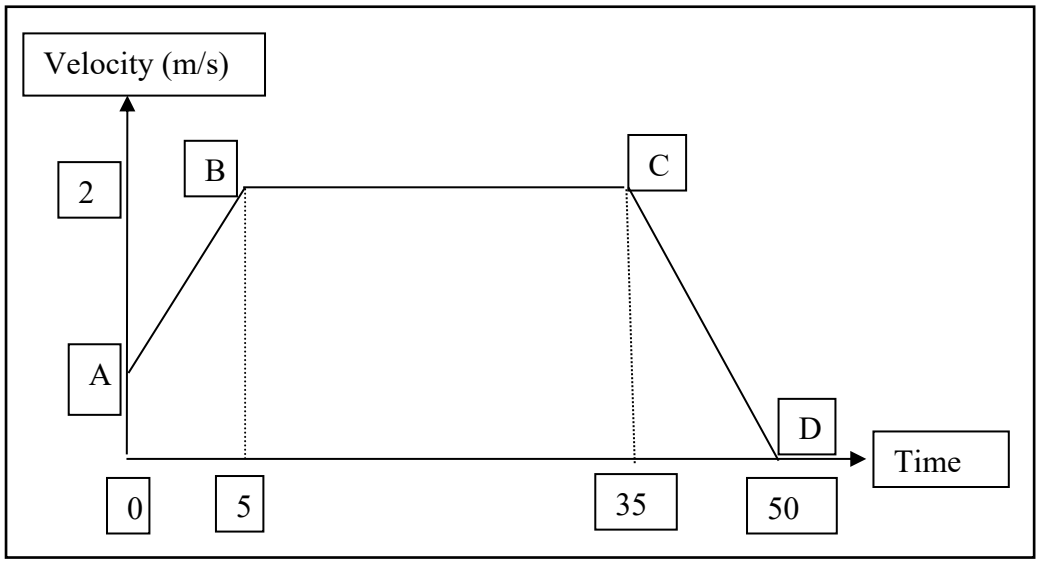


Figure 1 (c) / *Rajah 1 (c)*

i. Calculate the initial velocity of the car at the first 5 seconds if the car accelerated at 2.5 m/s^2.

Kira halaju awal kereta tersebut pada 5 saat yang pertama jika kereta memecut pada 2.5 m/s^2.

[3 marks]

[*3 markah*]

ii. Calculate the time taken when the car moves at uniform velocity.

Kirakan masa yang diambil semasa kereta tersebut dalam keadaan halaju yang seragam.

[2 marks]

[2 *markah*]

iii. Calculate the total distance taken by the car.

Kira jumlah jarak yang dilalui oleh kereta tersebut.

[5 marks]

[5 *markah*]

QUESTION 2

SOALAN 2

CLO1 (a) i. State **TWO (2)** examples of renewable energy sources and **TWO (2)** examples of non-renewable energy sources.
*Nyatakan **DUA (2)** contoh sumber tenaga yang boleh perbaharui dan **DUA (2)** contoh sumber tenaga yang tidak boleh diperbaharui.*

[4 marks]
[4 *markah*]

ii. Describe the principle of conservation of energy.
Terangkan prinsip keabadian tenaga.

[3 marks]
[3 *markah*]

CLO1 (b) A monkey with a mass of 4.5 kg is trying to jump from a tree which is 4.2 meters above from the ground. Calculate the potential energy and kinetic energy based on the following situations:
Seekor monyet dengan jisim 4.5 kg cuba untuk melompat dari pokok yang berketinggian 4.2 meter dari tanah. Kirakan tenaga keupayaan dan tenaga kinetik berdasarkan keadaan berikut:

i. when the monkey is still on the tree.
apabila monyet masih di atas pokok itu.

[4 marks]
[4 *markah*]

ii. when the monkey falls 1.8 meters off the tree.
apabila monyet jatuh 1.8 meter dari pokok itu.

[6 marks]
[6 *markah*]

CLO1

(c) i. A bag of cement is lifted vertically at the height of 2 meters. Calculate the amount of work done if the mass of cement is 50 kg.
Sebuah beg simen diangkat secara menegak pada ketinggian 2 meter. Kirakan kerja yang dilakukan jika jisim simen itu ialah 50 kg.

[4 marks]
[*4 markah*]

ii. Figure 2c (ii) shows a crane lifting a load of 900 kilograms to a height of 150 meters in 20 seconds. The power input of the crane is 75,000W. Calculate the efficiency of the crane. (Assuming g = 9.81 m/s^2)
Rajah 2c (ii) menunjukkan sebuah kren mengangkat beban 900 kilogram pada ketinggian 150 meter dalam masa 20 saat. Kuasa input kren adalah 75,000W. Kirakan keberkesanan kren. (Andaikan g= 9.81 m/s^2)

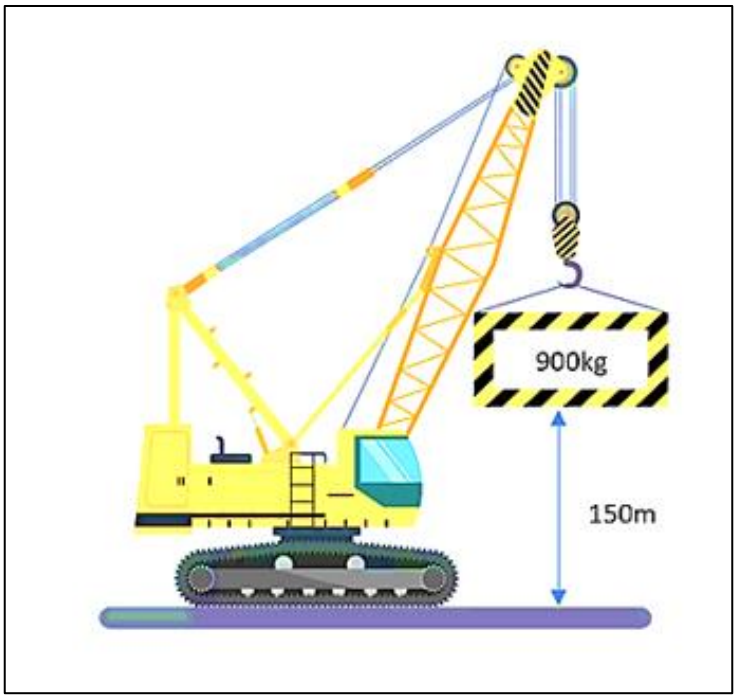


Figure 2c (ii) / *Rajah 2c (ii)*

[4 marks]
[4 *markah*]

QUESTION 3

SOALAN 3

CLO1 (a) i. State the definition of Archimedes Principle.
Nyatakan definisi Prinsip Archimedes.

[2 marks]
[2 *markah*]

ii. List **TWO (2**) characteristics of each solid, liquid and gas.
*Senaraikan **DUA (2)** ciri bagi setiap pepejal, cecair dan gas.*

[6 marks]
[6 *markah*]

CLO1 (b) i. A copper block with a volume of 0.0075 m^3 is placed in water. The block weighs 1.02 kg. Calculate the copper block density and its relative density. (Given ρ_{water} = 1000 kg/m^3)
Satu bongkah kuprum berisipadu 0.0075 m^3 *dimasukkan ke dalam air. Berat bongkah kuprum itu adalah 1.02 kg. Cari ketumpatan bahan dan ketumpatan bandingannya. (Diberi* ρ_{water} = 1000 kg/m^3)

[4 marks]
[*4 markah*]

ii. A cylindrical container with a base diameter of 0.5 m in contact with the floor exerts a pressure of 9500 Pa on the floor. Calculate the mass of the container.
Sebuah bekas silinder dengan diameter tapak 0.5 m bersentuhan dengan lantai memberikan tekanan 9500 Pa ke atas lantai. Kirakan jisim bekas tersebut.

[5 marks]
[*5 markah*]

CLO1

(c) A basic hydraulic system consists of a small piston and a large piston with a cross-sectional area of 4 cm^2 and 50 cm^2 respectively. When a force of 25 N is applied to the small piston, the small piston moves down by 10 cm. Calculate:

Satu sistem hidraulik yang asas terdiri daripada omboh kecil dan omboh besar dengan luas keratan rentas 4 cm^2 dan 50 cm^2 masing-masing. Apabila satu daya 25 N dikenakan ke atas omboh kecil, omboh kecil itu bergerak ke bawah sebanyak 10 cm. Hitungkan:

i. thrust exerted on the large piston.
daya tujah yang dikenakan ke atas omboh besar.

[4 marks]
[*4 markah*]

ii. distance of the large piston moves upward in cm.
jarak omboh besar naik ke atas dalam cm.

[4 marks]
[*4 markah*]

QUESTION 4

SOALAN 4

CLO1 (a) i. Define temperature and state the SI unit.

Berikan definisi suhu dan nyatakan unit SI.

[2 marks]

[2 *markah*]

ii. List **THREE (3)** heat transfer processes with **ONE (1)** suitable example for each.

*Senaraikan **TIGA (3)** proses pemindahan haba dengan **SATU (1)** contoh yang sesuai bagi setiap proses.*

[6 marks]

[6 *markah*]

CLO1 (b) i. A 0.5 kg block of aluminium is heated from 25 °C to 75 °C. The specific heat capacity of aluminium is 900 $Jkg^{-1}°C^{-1}$. Calculate the heat energy required to raise the temperature of the block.

Sebuah blok aluminium seberat 0.5 kg dipanaskan daripada 25 °C kepada 75 °C. Muatan haba tentu aluminium ialah 900 $Jkg^{-1}°C^{-1}$. Kirakan tenaga haba yang diperlukan untuk menaikkan suhu blok tersebut.

[4 marks]

[*4 markah*]

ii. In a container, water boils at 115°C. Calculate the heat supplied to 4.5 kg of water at 32°C to change to steam at the same temperature. Given the specific heat capacity of water, c is 4200 $Jkg^{-1}°C^{-1}$ and the specific latent heat of vaporization of water, L is 2.26 x 10^6 Jkg^{-1}.

Di dalam sebuah bekas, air mendidih pada suhu 115°C. Kirakan haba yang dibekalkan kepada 4.5 kg air pada suhu 32°C untuk menukarnya kepada wap pada suhu yang sama. Diberi muatan haba tentu air, c adalah 4200 $Jkg^{-1}°C^{-1}$ dan haba pendam tentu pengewapan air, L = 2.26 x 10^6 Jkg^{-1}

[6 marks]

[*6 markah*]

CLO1 (c) Aluminium with a mass of 0.051 kg at 97°C is immersed in 0.083 kg of water at 13°C. Assuming that no heat is lost to the surroundings, calculate the temperature of the mixture.

(Given that c_{water} = 4200 J/kg°C and c_{al} = 880 J/kg°C)

Aluminium yang berjisim 0.051 kg pada suhu 97°C direndam dalam 0.083 kg air pada suhu 13°C. Dengan mengandaikan bahawa tiada haba hilang ke sekeliling, kira suhu campuran.

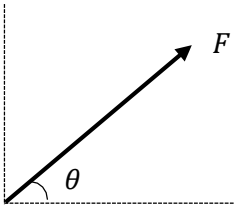
(Diberi c_{water} = 4200 J/kg°C and c_{al} = 880 J/kg°C)

[7 marks]

[*7 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