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)**

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

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

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**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

SULIT

**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.*

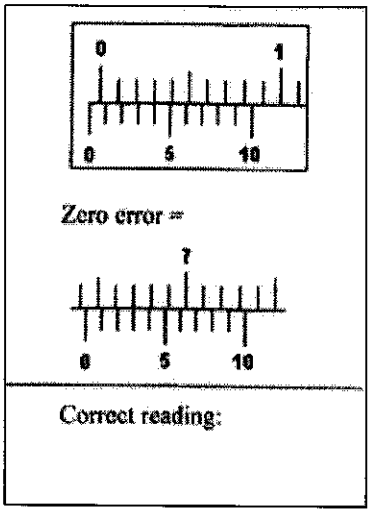



Figure 1b (ii) / *Rajah 1b (ii)*

[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.*

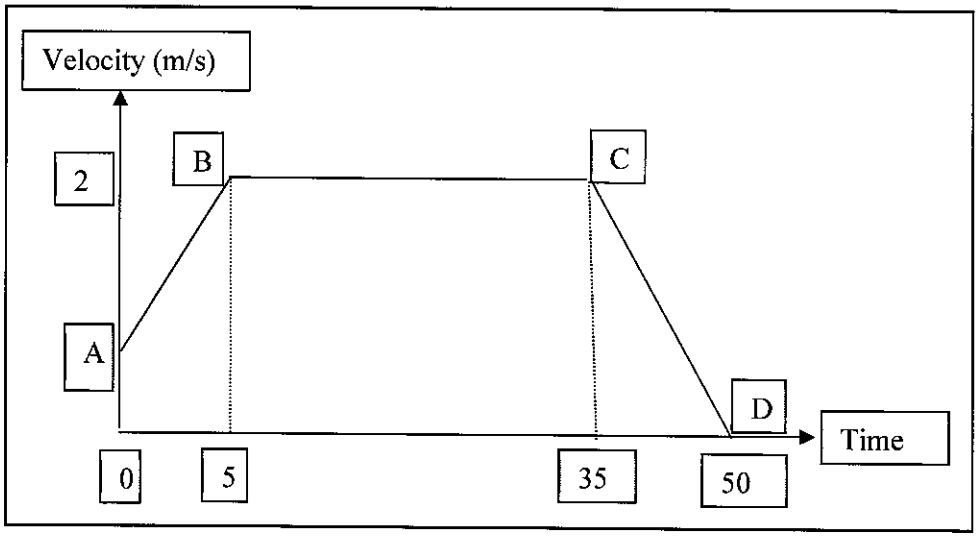



Figure 1 (c) / *Rajah 1 (c)*

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$^2$)*

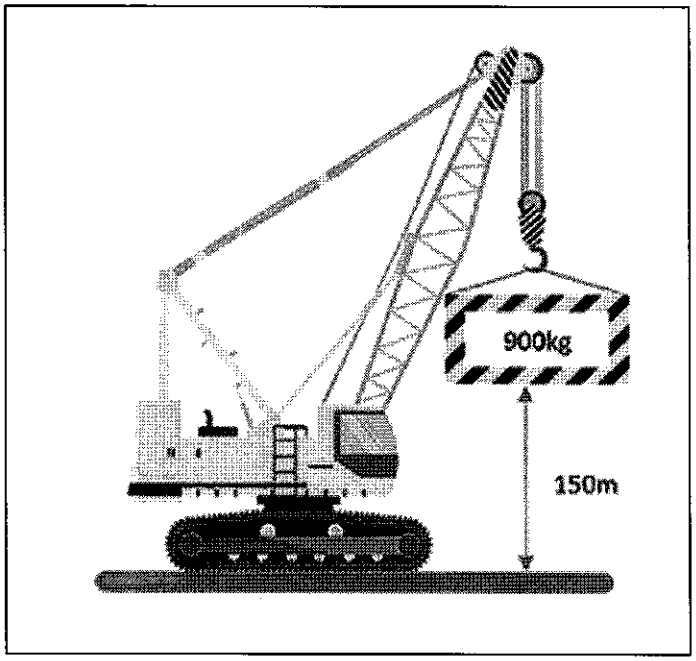



Figure 2c (ii) / *Rajah 2c (ii)*

[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 $\rho_{water}$ = 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* $\rho_{water}$ = 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.*

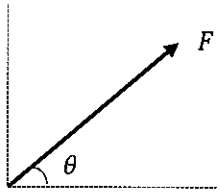
*(Diberi $c_{water}$ = 4200 J/kg°C and $c_{al}$ = 880 J/kg°C)*

[7 marks]

[*7 markah* ]

**SOALAN TAMAT**

# FORMULA DBS10012
# ENGINEERING SCIENCE

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

## 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 |