

**SULIT**



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

**JABATAN MATEMATIK, SAINS & KOMPUTER**

**PEPERIKSAAN AKHIR**

**SESI I : 2022/2023**

**DBS10012 : ENGINEERING SCIENCE**

**TARIKH : 13 DISEMBER 2022**

**MASA : 8.30 AM – 10.30 AM (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  
C1

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

*Takrifkan kuantiti asas dan kuantiti terbitan.*

[2 marks]

[2 markah]

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

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

[4 marks]

[4 markah]

CLO1  
C2

- (b) i. Convert the value of  $65 \text{ kNm}^{-2}$  to  $\text{Ncm}^{-2}$

*Tukarkan nilai  $65 \text{ kNm}^{-2}$  kepada unit  $\text{Ncm}^{-2}$*

[3 marks]

[3 markah]

- ii. A car is accelerated at  $2 \text{ ms}^{-2}$  from an initial velocity of  $15 \text{ ms}^{-1}$  for 1.5 minutes. Calculate the final velocity of the car.

*Sebuah kereta memecut dengan pecutan  $2 \text{ ms}^{-2}$  dari halaju awal  $15 \text{ ms}^{-1}$  selama 1.5 minit. Kirakan halaju akhir kereta tersebut.*

[4 marks]

[4 markah]

CLO1  
C3

- (c) A train moves with an initial velocity of  $18 \text{ kmh}^{-1}$  and accelerates uniformly for 10 seconds until it reaches the velocity of  $20 \text{ ms}^{-1}$ . This velocity is maintained for 25 seconds and then the train decelerates uniformly for 5 seconds until it stops.

*Sebuah keretapi bergerak dengan halaju awal  $18 \text{ kmj}^{-1}$  dan memecut seragam selama 10 saat sehingga mencapai halaju  $20 \text{ ms}^{-1}$ . Halaju ini dikekalkan selama 25 saat dan kemudiaannya keretapi tersebut mengalami nyahpecutan seragam selama 5 saat sehingga ianya berhenti.*

- i) Sketch a velocity-time graph for the whole journey of the train.

*Lakarkan graf halaju-masa bagi keseluruhan perjalanan keretapi.*

[5 marks]

[5 markah]

- ii) Calculate the acceleration of the train.

*Kirakan pecutan keretapi.*

[2 marks]

[2 markah]

- iii) Calculate the total distance travelled by the train.

*Kira jumlah jarak yang dilalui oleh keretapi.*

[5 marks]

[5 markah]

## QUESTION 2

## SOALAN 2

CLO1  
C1

- (a) i. Define renewable energy and non-renewable energy.  
*Takrifkan tenaga yang boleh diperbaharui dan tenaga yang tidak boleh diperbaharui.*

[4 marks]

[4 markah]

- ii. State the principle of energy conservation.  
*Nyatakan prinsip keabadian tenaga.*

[3 marks]

[3 markah]

CLO1  
C2

- (b) i. A force of 600 N is used to move a box horizontally at a distance of 5 m in the direction of the force exerted. Calculate the work done.

*Daya 600 N digunakan untuk menggerakkan sebuah kotak secara mengufuk pada jarak 5 m mengikut arah daya yang dikenakan. Kirakan nilai kerja yang dilakukan.*

[2 marks]

[2 markah]

- ii. A speedboat with a mass of 1 tonne has a 850 000 J of kinetic energy. Calculate the velocity of the boat.

*Sebuah bot laju dengan jisim 1 tan mempunyai tenaga kinetik berjumlah 850 000J. Kirakan halaju bot tersebut.*

[4 marks]

[4 markah]

CLO1  
C3

- iii. A student with a mass of 55 kg takes 25 seconds to run up a flight of stairs with a height of 2.6 m. Calculate the power used by the student?

*Seorang pelajar berjisim 55 kg mengambil masa 25 saat untuk berlari menaiki tangga yang mempunyai berketinggian 2.6 m. Kirakan kuasa yang digunakan oleh pelajar tersebut?*

[4 marks]

[4 markah]

- (c) The motor of an electric drill is supplied with an input power of 2.0 horse power. If its efficiency is 85% , calculate.

(Given 1 horse power = 745.6 Watt)

*Sebuah motor gerudi elektrik dibekalkan dengan kuasa kemasukan sebanyak 2.0 kuasa kuda. Jika kecekapan motor tersebut 85%, kirakan.*

*(Diberi 1 kuasa kuda = 745.6 Watt)*

- i Output power of electric drill  
*Kuasa keluaran gerudi elektrik*

[4 marks]

[4 markah]

- ii Work done in 1 minute in (State in unit of kiloJoule)

*Kerja siap dalam 1 minit dalam (Nyatakan dalam unit kiloJoule)*

[4 marks]

[4 markah]

## QUESTION 3

## SOALAN 3

CLO1  
C1

- (a) i. State the Pascal's Principle  
*Nyatakan Prinsip Pascal.*

[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  
C3

- (b) 80 N force was imposed at one cubic container with a dimension of 10 cm x 20 cm x 30 cm as shown in Figure 3(b). The container was filled with 4.8 kg of oil. Calculate.

*Daya 80 N dikenakan pada satu bekas kubus dengan berukuran 10 cm × 20 cm × 30 cm seperti yang ditunjukkan pada Rajah 3(b). Bekas itu diisi dengan 4.8 kg minyak. Kirakan.*

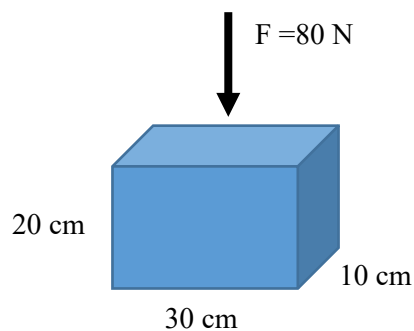


Figure 3(b) / Rajah 3(b)

- i. The density of oil  
*Ketumpatan minyak.*
- [3 marks]  
[3 markah]
- ii. The relative density of oil  
*Ketumpatan bandingan minyak*
- [1 marks]  
[1 markah]
- iii. The pressure at the bottom of the container.  
*Tekanan pada bahagian bawah bekas itu.*
- [5 marks]  
[5 markah]

CLO1  
C3

- (c) The Figure 3(c) below shows a hydraulic jack. Given that the cross-sectional areas of the piston S and piston R, is  $20 \text{ cm}^2$  and  $80 \text{ cm}^2$  respectively. If the piston S is pushed by a force of  $900 \text{ N}$ , calculate.

*Rajah 3(c) di bawah menunjukkan sebuah jek hidraulik. Diberi luas keratan rentas piston S dan piston R iaitu  $20 \text{ cm}^2$  dan  $80 \text{ cm}^2$  masing-masing. Jika piston S ditolak oleh daya  $900 \text{ N}$ , hitung.*

- i. The mass of the load in kilogram (kg).

*Jisim bagi beban dalam kilogram (kg).*

[5 marks]

[5 markah]

- ii. If the displacement of piston S is  $30 \text{ cm}$ , calculate the displacement of piston R.

*Jika piston S bergerak ke bawah  $30 \text{ cm}$ , hitungkan jarak bagi piston R.*

[3 marks]

[3 markah]

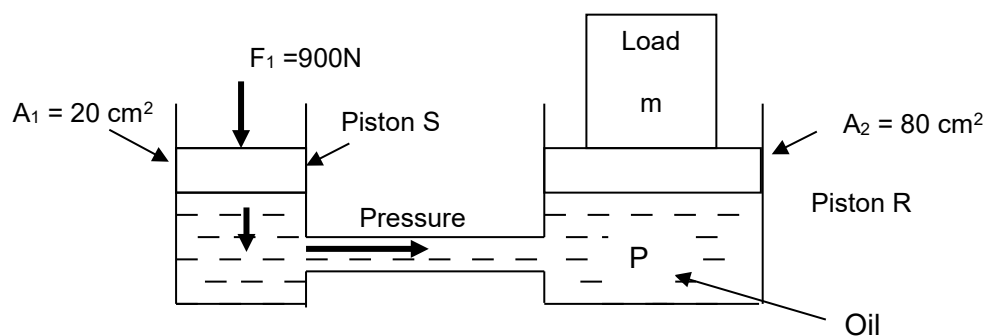


Figure 3(c)/ Rajah 3(c)



## QUESTION 4

## SOALAN 4

CLO1  
C1

- (a) i. Define temperature and state its SI unit.

*Takrifkan suhu dan nyatakan SI unitnya.*

[2 marks]

[2 markah]

- ii. List
- THREE (3)**
- methods of heat transfer and give an example for each method.

*Senaraikan **TIGA (3)** kaedah pemindahan haba dan berikan contoh untuk setiap kaedah tersebut.*

[6 marks]

[6 markah]

CLO1  
C2

- (b) i. Calculate heat quantity required to raise the temperature of a 3.0 kg piece of glass from 24°C to 36 °C?

(Specific Heat Capacity of glass = 840 Jkg<sup>-1</sup> °C<sup>-1</sup>)*Kirakan kuantiti haba yang diperlukan untuk menaikkan suhu bagi sekeping kaca berjisim 3000g daripada 24°C ke 36 °C? (Muatan haba tentu gelas = 840 Jkg<sup>-1</sup> °C<sup>-1</sup>)*

[3 marks]

[3 markah]

- ii. Calculate heat quantity required to change 500 g of water at 100 °C to steam at 100 °C? (Specific heat of vaporization of water
- $L_v = 2.26 \times 10^6 \text{Jkg}^{-1}$
- )

*Berapakah kuantiti haba yang diperlukan untuk mengubah 500 g air pada 100 °C kepada stim 100 °C?**(Haba tentu pengewapan air,  $L_v = 2.26 \times 10^6 \text{Jkg}^{-1}$ )*

[3 marks]

[3 markah]

- iii. Calculate the specific heat capacity of a liquid when a quantity of heat released out from 800 g of liquid is 136 kJ with change of liquid temperature is 40 °C.

*Kirakan muatan haba tentu bagi cecair apabila 136 kJ tenaga haba dibebaskan dari 800 g cecair tersebut, dengan perubahan suhu cecair adalah 40 °C.*

[4 marks]

[4 markah]

CLO1  
C3

- (c) A mechanic drops a steel nut with a mass of 20 g with the initial temperature of 90 °C into 250 g of water at 24 °C in a polystyrene cup. Determine the temperature when the steel nut and water have reached thermal equilibrium? (Assume the heat exchange is between the steel nut and water only). (Specific heat load of water,  $c = 4200 \text{ Jkg}^{-1}\text{°C}^{-1}$ , specific heat load of steel =  $450 \text{ Jkg}^{-1}\text{°C}^{-1}$ )

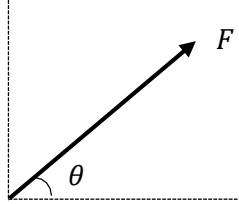
*Seorang mekanik menjatuhkan sebuah nat keluli berjisim 20 g dengan suhu awal 90 °C ke dalam 250 g air pada 24 °C dalam sebuah cawan polisterin. Berapakah suhu apabila nat keluli dan air telah mencapai keseimbangan terma? (Anggap pertukaran haba berlaku adalah antara nat keluli dan air sahaja). (Muatan haba tentu air,  $c = 4200 \text{ Jkg}^{-1}\text{°C}^{-1}$ , muatan haba tentu keluli,  $c = 450 \text{ Jkg}^{-1}\text{°C}^{-1}$ )*

[7 marks]

[7 markah]

**SOALAN TAMAT**

**FORMULA**  
**DBS10012: ENGINEERING SCIENCE**

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

## 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 feet (ft)	0.9144 meter (m)
1 mile (mi)	1,760 yards (yd)	1.60934 kilometer (km)
Area		
1 in <sup>2</sup>		6.4516 cm <sup>2</sup>
1 ft <sup>2</sup>		0.09 m <sup>2</sup>
1 yd <sup>2</sup>	9 ft <sup>2</sup>	0.8361 m <sup>2</sup>
1 acre	4,840 yd <sup>2</sup>	4046.86 m <sup>2</sup> / 0.405 hectare
1 mile <sup>2</sup>	640 acres	2.590 km <sup>2</sup>
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 <sup>3</sup>		0.03 m <sup>3</sup>
1 yd <sup>3</sup>		0.76 m <sup>3</sup>

## Temperature Conversion

Temperature	
Convert Fahrenheit (F) to Celsius (C)	$(\text{degrees F} - 32) \times 0.555$
Convert Celsius (C) to Fahrenheit (F)	$(\text{degrees C} \times 1.8) + 32$