

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENGAJIAN POLITEKNIK  
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR  
SESI JUN 2014

**BB101: ENGINEERING SCIENCE**

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**TARIKH : 29 OKTOBER 2014**  
**TEMPOH : 8.30 AM – 10.30 AM (2 JAM)**

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Kertas ini mengandungi **TUJUH BELAS (17)** halaman bercetak.

Bahagian A: Struktur (6 soalan)

Dokumen sokongan yang disertakan : Formula

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**JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

SULIT



**STRUCTURED: 100 MARKS****STRUKTUR : 100 MARKAH****INSTRUCTION:**

This section consists of SIX (6) structured questions. Answer FOUR (4) questions only.

**ARAHAN :**

Bahagian ini mengandungi ENAM (6) soalan berstruktur. Jawab EMPAT (4) soalan sahaja.

**QUESTION 1****SOALAN 1**

CLO1  
C1

- (a) Define the following terms and state ONE (1) example for each:

Takrif istilah-istilah tersebut dan nyatakan SATU (1) contoh setiap satu:

- i. Base Quantity

Kuantiti Asas

[2 marks]

[2 markah]

- ii. Vector Quantity

Kuantiti Vektor

[2 marks]

[2 markah]

- iii. Uniform Motion

Gerakan Seragam

[2 marks]

[2 markah]

CLO1  
C2

- (b) Give TWO (2) differences between distance and displacement.

Berikan DUA (2) perbezaan di antara jarak dan sesaran.

[4 marks]

[4 markah]

CLO3  
C3

- (c) A proton in a uniform electric field moves along a straight line with constant acceleration. Starting from rest, it attains a velocity of 1000km/s at a distance of 0.01m. Calculate:

*Satu proton dalam medan magnet seragam bergerak sepanjang garis lurus dengan pecutan yang seragam. Halaju adalah 1000km/s bermula daripada keadaan pegun dalam jarak 0.01m. Kira:*

- i. Acceleration.

*Pecutan.*

[3 marks]

*[3 markah]*

- ii. The time required to reach the final velocity.

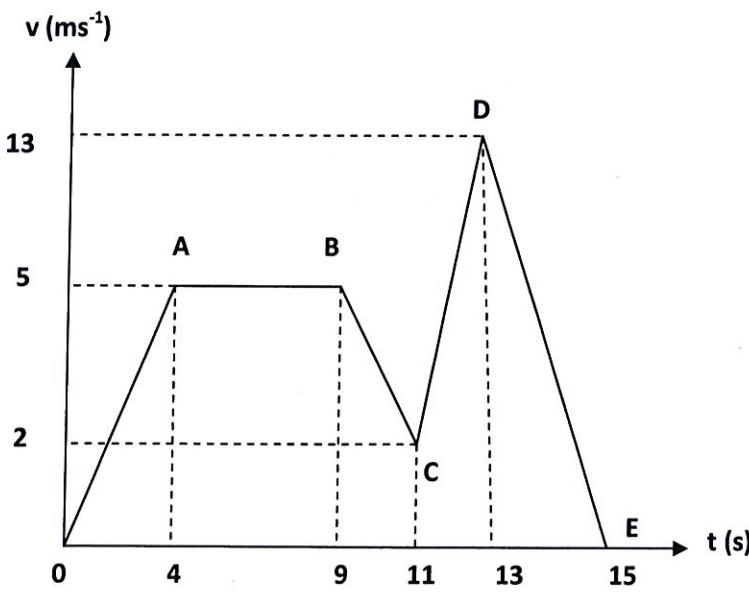
*Masa untuk mencapai halaju tersebut.*

[4 marks]

*[4 markah]*

CLO3  
C3

(d) The graph below represents the motion of a car for the first 15 seconds.

*Graf di bawah menunjukkan gerakan kereta bagi 15 saat pertama.*

- i. Describe the motion of the car represented by **OA** and **DE**.

*Terangkan gerakan kereta yang diwakili oleh **OA** dan **DE**.*

[2 marks]

[2 markah]

- ii. Calculate the acceleration at **CD**.

*Kira pecutan di **CD**.*

[2 marks]

[2 markah]

- iii. Calculate the total distance for the whole journey.

*Kira jumlah jarak bagi keseluruhan perjalanan.*

[4 marks]

[4 markah]

**QUESTION 2****SOALAN 2**

- CLO1      (a) Give **TWO (2)** differences between weight and mass.  
 C1                  *Berikan DUA(2) perbezaan di antara berat dan jisim.*

[4 marks]

[4 markah]

- CLO3      (b) Find the resultant force for **Figure 2(b)**.  
 C2                  *Dapatkan daya paduan untuk Rajah 2(b).*

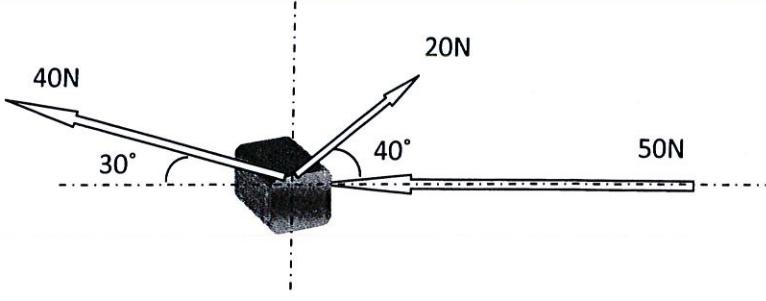


[2 marks]

[2 markah]

**Figure 2(b)**  
**Rajah 2(b)**

- CLO3      (c) Based on **Figure 2(c)**, calculate the magnitude and direction of the resultant force.  
 C2                  Give your answers accurate to two decimal places.  
*Berdasarkan Rajah 2 (c), hitungkan daya paduan dan arah daya tersebut.*  
*Berikan jawapan anda tepat kepada dua tempat perpuluhan.*



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

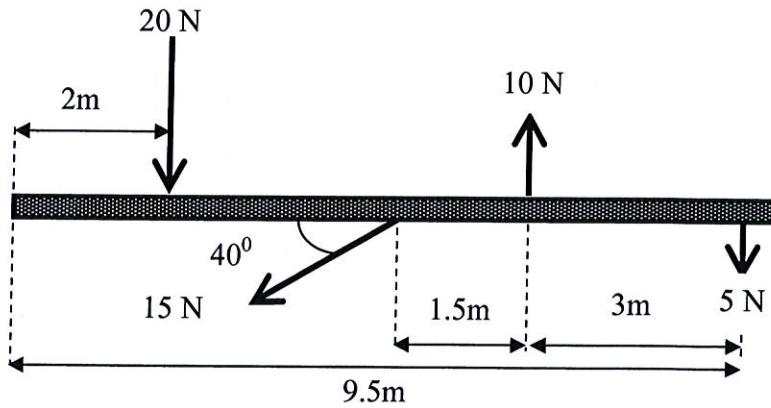
[12 marks]

[12 markah]

CLO3  
C3

- (d) Forces are applied on the beam in **Figure 2(d)**. Find the centre of gravity so that it is in equilibrium.

*Beberapa daya telah dikenakan pada rasuk seperti dalam **Rajah 2(d)**. Dapatkan pusat graviti supaya rasuk tersebut berada dalam keseimbangan.*



**Figure 2(d)**

**Rajah 2(d)**

[7 marks]

[7 markah]

**QUESTION 3****SOALAN 3**CLO1  
C1

- (a) Define each of the following terms:

*Terangkan setiap yang berikut:*

i. Work

*Kerja*

ii. Power

*Kuasa*

iii. Efficiency

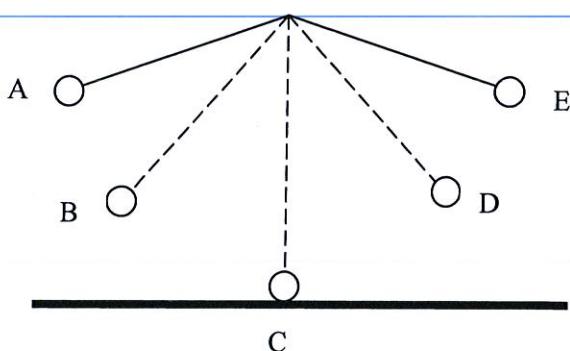
*Kecekapan*

[3 marks]

[3 markah]

CLO1  
C1

- (b)
- Figure 3(b)**
- shows a swing of pendulum bob from point A to E. Explain the Principle of Conservation of Energy regarding the conversion of Kinetic Energy and Potential Energy for each point.

*Rajah 3(b) menunjukkan sebuah bandul yang berayun dari kedudukan A ke E.**Terangkan konsep keabadian tenaga terhadap perubahan tenaga kinetik dan tenaga keupayaan yang berlaku pada setiap kedudukan.***Figure 3(b)**  
*Rajah 3 (b)*

[5 marks]

[5 markah]

(c) Fifi is late for the Engineering Science class, and she runs up the stairs quickly.

The mass of her body is 58 kg and the distance covered by Fifi is 3 m in 2.5 second. Calculate:

*Fifi telah lewat ke kelas Sains Kejuruteraan, dan dia berlari dengan pantas menaiki tangga. Jisimnya ialah 58 kg dan jarak dia berlari ialah 3m dalam 2.5 saat. Kira:*

- The work done by Fifi while climbing the stairs.

*Kerja yang dilakukan oleh Fifi semasa menaiki tangga.*

[4 marks]  
[4 markah]

- Power generated by Fifi.

*Kuasa yang dihasilkan oleh Fifi*

[3 marks]  
[3 markah]

CLO3  
C3

- (d) A ball of mass 0.5kg is dropped from a rack which is 1.2 m from the floor as shown in Figure 3(d). Calculate:

*Sebiji bola berjisim 0.5kg dijatuhkan dari rak setinggi 1.2 m daripada lantai seperti di rajah 3(d). Kirakan:*

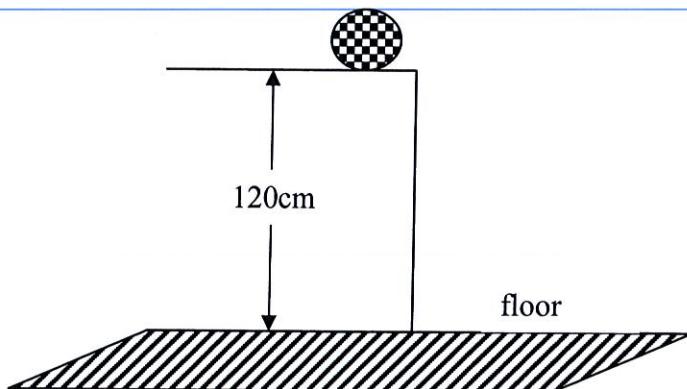


Figure 3(d)  
Rajah 3 (d)

- i. The maximum potential energy of the ball.

*Tenaga keupayaan maksimum bola tersebut.*

[2 marks]

[2 markah]

- ii. The kinetic energy if the ball is 0.5 m from the floor.

*Tenaga kinetik bola tersebut sekiranya ia berada pada ketinggian 0.5m dari lantai.*

[4 marks]

[4markah]

CLO3  
C3

- (e) An electric motor is used to lift a mass of 120kg. The power of the motor is 1200W. If the motor is 60% efficient, calculate the time taken to lift the mass through a height of 4.2m.

*Sebuah motor elektrik digunakan untuk mengangkat beban 120kg. Kuasa motor tersebut adalah 1200W. Jika kecekapan motor ialah 60%, kirakan masa yang diperlukan untuk mengangkat beban itu setinggi 4.2m.*

[4marks]

[4 markah]

**QUESTION 4****SOALAN 4**CLO 1  
C1

- (a) Give the definition and SI unit below.

*Berikan definisi dan SI unit dibawah.*

- i. Density

*Ketumpatan*

[2 marks]

[2 markah]

- ii. Pressure.

*Tekanan*

[2 marks]

[2 markah]

CLO 1  
C1

- (b) State
- TWO (2)**
- characteristics each of the followings:

*Nyatakan DUA (2) ciri bagi yang berikut:*

- i. Solid

*Pepejal*

[2 marks]

[2 markah]

- ii. Liquid

*Cecair*

[2 marks]

[2 markah]

- iii. Gas

*Gas*

[2 marks]

[2 markah]

CLO 3  
C3

- (c) A solid metal cylinder with density of
- $50\text{kg/m}^3$
- has a radius of 5 cm and length of 25 cm. Determine the mass of the solid.

[4 marks]

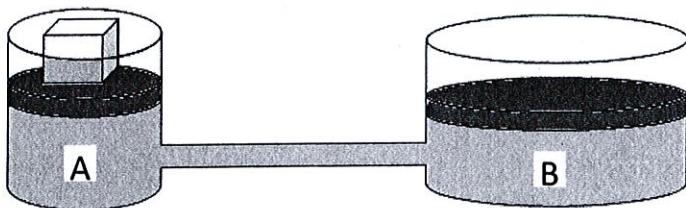
*Satu silinder logam dengan ketumpatan  $50\text{kg/m}^3$  mempunyai jejari 5 cm dan panjang 25 cm. Tentukan jisim pepejal tersebut.*

[4 markah]

CLO 3  
C2

- (d) **Figure 4(d)** shows a hydraulic system. The radius of piston A and piston B are 3.0 m and 15.0 m respectively. A block with a mass of 50 kg is placed on top of piston A.

*Rajah 4(d) menunjukkan sistem hidraulik. Jejari omboh A dan omboh B masing-masing adalah 3.0 m dan 15.0 m. Sebuah blok dengan jisim 50 kg diletakkan di atas omboh A.*



**Figure 4(d)**

*Rajah 4(d)*

- i. Calculate the pressure applied on piston A. [3 marks]

*Kirakan tekanan yang dikenakan pada omboh A. [3 markah]*

- ii. Calculate the force acting on piston B. [3 marks]

*Kirakan daya yang bertindak pada omboh B. [3 markah]*

CLO 3  
C3

- (e) **Figure 4(e)** shows a metal ball is immersed in water. The reading of the spring balance used to measure the weight of the metal ball is 5 N, while the volume of the displaced water is  $100 \text{ cm}^3$ . Calculate the actual weight of the metal ball.  
(Density of water =  $1000 \text{ kgm}^{-3}$ )

*Rajah 4 (e) menunjukkan sebiji bebola logam terendam di dalam air. Bacaan pada spring kesembarangan yang digunakan untuk mengukur berat bebola logam tersebut adalah 5 N, manakala isipadu air yang tersesar adalah  $100 \text{ cm}^3$ . Kirakan berat sebenar bebola logam tersebut. (Ketumpatan air =  $1000 \text{ kgm}^{-3}$ )*

[5 marks]

[5 markah]

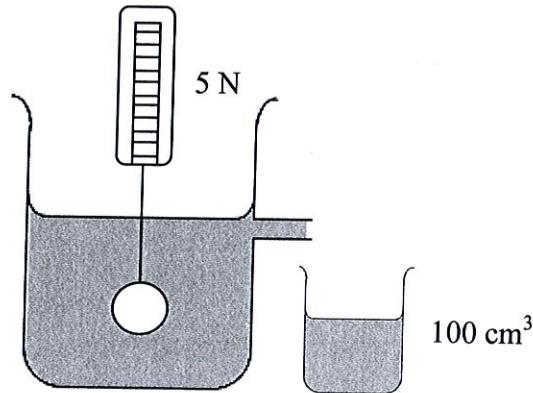


Figure 4 (e)

*Rajah 4(e)*

**QUESTIONS****SOALAN 5**CLO1  
C1

- (a) Define the following terms and state its SI unit:  
*Takrifkan dan nyatakan unit SI bagi setiap yang berikut:*

(i) Heat

*Haba*

[2 marks]

[2 markah] 

(ii) Temperature

*Suhu*

[2 marks]

[2 markah]

(iii) Heat Capacity

*Muatan Haba*

[2 marks]

[2 markah]

(iv) Specific Heat Capacity

*Muatan Haba Tentu*

[2 marks]

[2 markah] CLO1  
C1

- (b) Define the thermal equilibrium.  
*Takrif keadaan keseimbangan terma.*

[2 marks]

[2 markah]

CLO3  
C3

- (c) Calculate the mass of the block if 24062.50 J of energy is absorbed by a copper block when it is heated from 20°C to 45°C. Given that the specific heat capacity of copper is  $385 \text{ J kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$ .

*Kira jisim satu blok kuprum, jika 24062.50 J tenaga diserap oleh blok kuprum tersebut apabila dipanaskan dari 20°C hingga 45°C. Diberi muatan haba tentu kuprum ialah  $385 \text{ J kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$ .*

[3 marks]

[3 markah]

CLO3  
C3

- (d) The temperature of the final mixture is 45°C when 0.4kg water of 70°C is mixed with a certain amount of water of 30°C, Calculate the original mass of the 30°C water.

*Suhu akhir campuran air ialah 45°C apabila 0.4kg air bersuhu 70°C dicampurkan dengan sejumlah air bersuhu 30°C. Kira jisim asal bagi air yang bersuhu 30°C.*

[5 marks]

[5 markah]

CLO3  
C3

- (e) 150 grams of water at the temperature of 20°C is poured in a well-insulated beaker, so that there is no interchange of heat with the outside. Calculate the equilibrium temperature if 50 grams of water at 70°C is mixed with the water in a well-insulated beaker.

*150 gram air pada suhu 20°C dituang ke dalam bikar penebat, supaya tidak berlaku pertukaran dengan haba di luar. Kirakan keseimbangan suhu jika 50 gram air pada suhu 70°C dicampurkan bersama air yang berada di dalam bikar penebat itu.*

[7 marks]

[7 markah]

**QUESTION 6****SOALAN 6**CLO 1  
C1

- (a) Describe Ohm's Law.

*Terangkan Hukum Ohm.*

[2 marks]

[2 markah]

CLO 1  
C1

- (b) Given 3 resistors and a battery. Sketch series and parallel circuits.

*Diberi 3 resistor dan satu bateri. Lakarkan litar sesiri dan selari.*

[4 marks]

[4 markah]

CLO 1  
C1

- (c) List
- FOUR (4)**
- factors that influence resistance.

*Senaraikan **EMPAT (4)** faktor yang mempengaruhi rintangan.*

[4 marks]

[4 markah]

CLO 3  
C2

- (d) Calculate the resistance of an aluminium wire if the given resistivity of the wire is
- $2.8 \times 10^{-8} \Omega m$
- , and the wire is 45m long with a cross-sectional area of
- $0.275m^2$
- .

*Kirakan rintangan pada wayar aluminium jika diberi kerintangan wayar itu adalah  $2.8 \times 10^{-8} \Omega m$  dan panjang wayar 45m dengan luas keratan rentasnya adalah  $0.275m^2$ .*

[3 marks]

[3 markah]

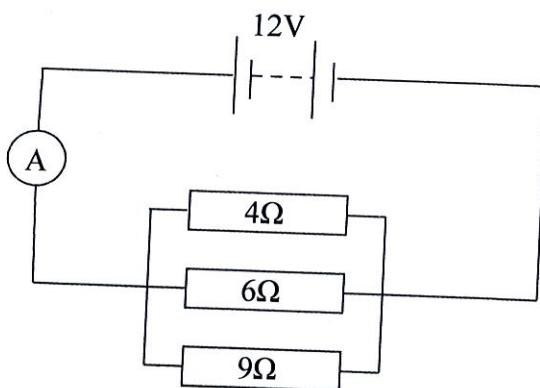
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CLO 3  
C2

- (e) Three resistors of  $4\Omega$ ,  $6\Omega$  and  $9\Omega$  are connected in parallel with a 12V battery as shown in **Figure 6(f)**. Calculate:

*Tiga perintang,  $4\Omega$ ,  $6\Omega$  dan  $9\Omega$  disambung secara selari dengan bateri 12V seperti yang ditunjukkan dalam Rajah 6(f). Kirakan;*



**Figure 6(f)**

*Rajah 6(f)*

CLO 3  
C2

- i. The total resistance in the circuit.

*Jumlah rintangan dalam litar.*

[3 marks]

*[3 markah]*

CLO 3  
C2

- ii. The total current flowing in the circuit.

*Jumlah arus yang mengalir dalam litar.*

[3 marks]

*[3 markah]*

CLO 3  
C2

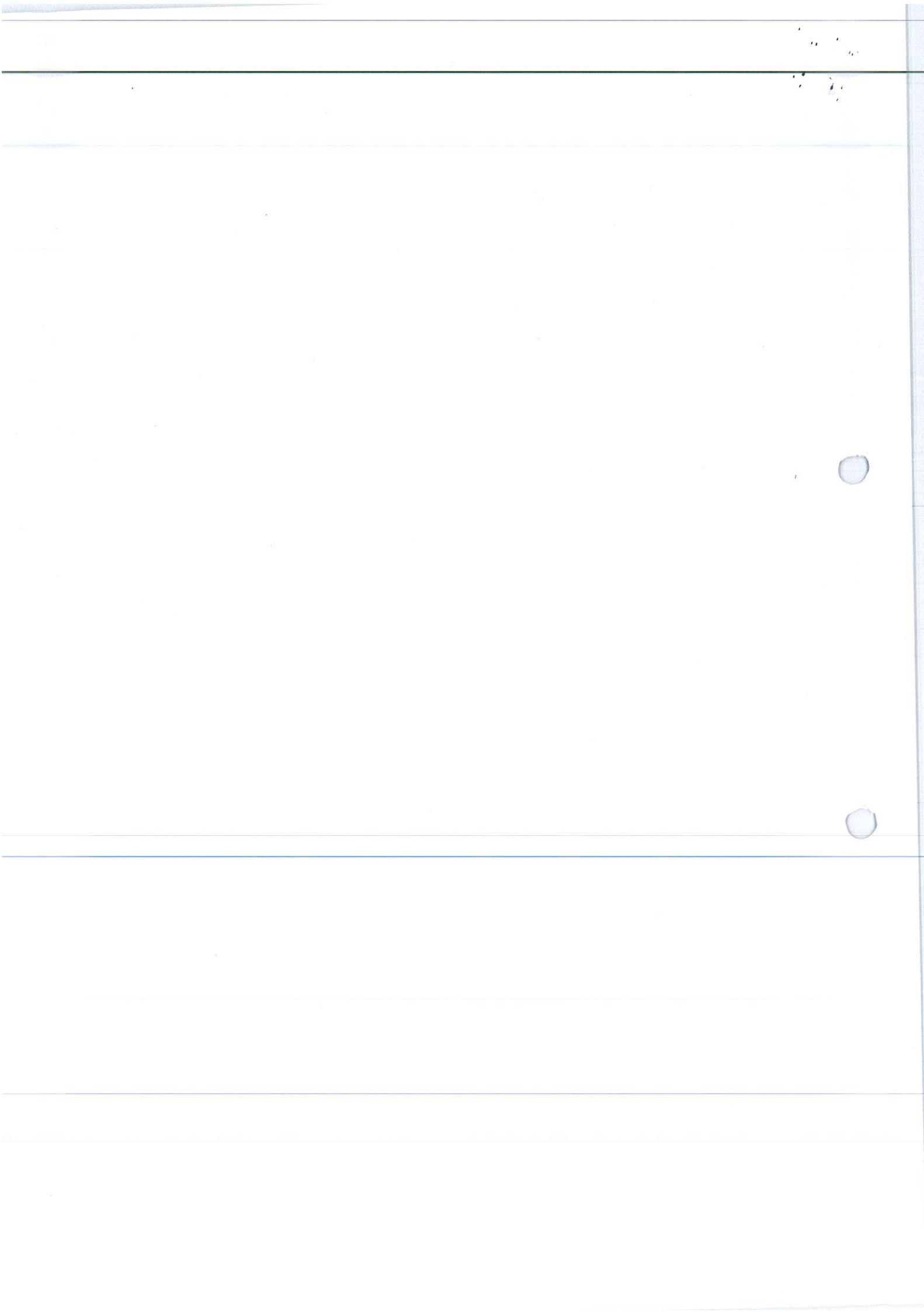
- iii. The current flowing through **EACH** resistor.

*Arus yang mengalir melalui **SETIAP** perintang.*

[6 marks]

*[6 markah]*

**SOALAN TAMAT**



**FORMULA BB101**  
**ENGINEERING SCIENCE**

$$g = 9.81 \text{ m/s}^2$$

$$\rho = \frac{m}{V}$$

$$W = mg$$

$$\rho_{relative} = \frac{\rho_{substance}}{\rho_{water}}$$

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$P = \frac{F}{A}$$

$$s = \frac{1}{2}(u+v)t$$

$$P = \rho gh$$

$$v^2 = u^2 + 2as$$

$$\text{Pascal's Principle}, \frac{F_1}{A_1} = \frac{F_2}{A_2}$$

$$F = mg$$

$$F_B = \rho V g$$

$$F = ma$$

$$Q = mc\theta$$

$$F_x = F \cos \theta$$

$$c_{water} = 4,200 \text{ J/kg}^\circ C$$

$$F_y = F \sin \theta$$

$$\rho_{water} = 1,000 \text{ kg/m}^3$$

$$F_R = \sqrt{(\sum F_x)^2 + (\sum F_y)^2}$$

$$C = \frac{Q}{V}$$

$$\theta = \tan^{-1} \left( \frac{F_y}{F_x} \right)$$

$$R = \frac{\rho l}{A}$$

$$M = Fd$$

$$V = IR$$

$$E_p = mgh$$

$$Q = It$$

$$E_k = \frac{1}{2}mv^2$$

$$Q = ne \quad e = \pm 1.6 \times 10^{-19} C$$

$$W = Fd$$

$$E_p = \frac{1}{2}CV^2$$

$$W = F \cos \theta \times d$$

$$R_{series}, R_T = R_1 + R_2 + R_3 + \dots + R_n$$

$$W = \tau \times \theta_{rad}$$

$$R_{parallel}, \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots + \frac{1}{R_n}$$

$$P = \frac{W}{t}$$

$$P = Fv$$

