

**SULIT**



**KEMENTERIAN PENDIDIKAN TINGGI  
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI**

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

**JABATAN KEJURUTERAAN ELEKTRIK**

**PEPERIKSAAN AKHIR**

**SESI II : 2025/2026**

**DEE10133 : MEASUREMENT DEVICES**

**TARIKH : 05 MEI 2026**

**MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)**

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Kertas soalan ini mengandungi **LAPAN (8)** halaman bercetak.

Bahagian A: Struktur (4 soalan)

Bahagian B: Esei (1 soalan)

Dokumen sokongan yang disertakan : Tiada

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**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

**SULIT**

**SECTION A: 80 MARKS****BAHAGIAN A: 80 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

**ARAHAN:**

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

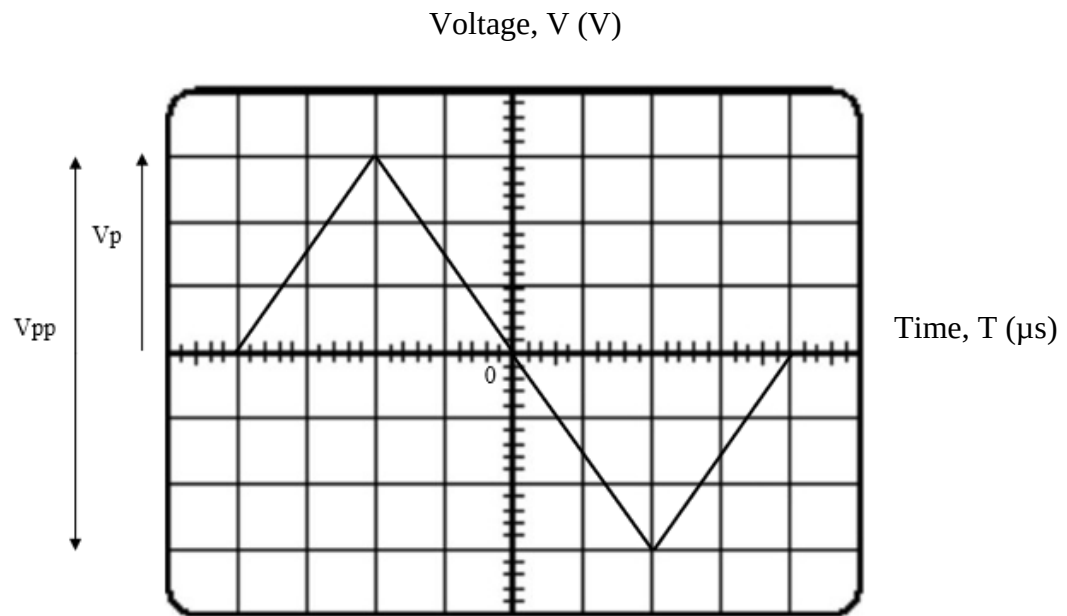
**QUESTION 1****SOALAN 1**

- |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLO1 | (a) State <b>TWO (2)</b> functions of switch S in a two-range DC Ammeter.<br><i>Nyatakan <b>DUA (2)</b> fungsi suis S dalam DC Ammeter dua julat.</i><br><div style="text-align: right;">[4 marks]<br/>[4 markah]</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| CLO1 | (b) Explain systematic error and its <b>TWO (2)</b> types in electrical measurements.<br><i>Terangkan ralat sistematik dan <b>DUA (2)</b> jenisnya dalam pengukuran elektrik.</i><br><div style="text-align: right;">[6 marks]<br/>[6 markah]</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| CLO1 | (c) A PMMC meter has an internal resistance of $20\ \Omega$ and a full-scale deflection current of 5 mA. With the aid of multirange DC MiliAmmeter circuit, compute the values of shunt resistors $R_{sh1}$ and $R_{sh2}$ required to design a multirange ammeter with current ranges of 0 – 25 mA and 0 – 50 mA.<br><i>Sebuah meter PMMC mempunyai rintangan dalaman <math>20\ \Omega</math> dan arus pesongan skala penuh 5 mA. Dengan bantuan litar DC MiliAmmeter pelbagai julat, hitung nilai perintang shunt <math>R_{sh1}</math> dan <math>R_{sh2}</math> yang diperlukan untuk mereka bentuk sebuah ammeter berbilang julat dengan julat arus 0 – 25 mA dan 0 – 50 mA.</i><br><div style="text-align: right;">[10 marks]<br/>[10 markah]</div> |

## QUESTION 2

## SOALAN 2

- |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLO1 | <p>(a) Identify <b>FOUR (4)</b> parts of an analogue multimeter.<br/> <i>Kenalpasti <b>EMPAT (4)</b> bahagian multimeter analog.</i></p> <p style="text-align: right;">[4 marks]<br/>[4 markah]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| CLO1 | <p>(b) Compare ranges and scales in an analogue multimeter.<br/> <i>Bandingkan julat dan skala dalam sebuah multimeter analog.</i></p> <p style="text-align: right;">[6 marks]<br/>[6 markah]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| CLO1 | <p>(c) Figure A2(c) is shown as a triangular waveform that is displayed on the screen of an oscilloscope. If the vertical attenuation volt/div is set at 2V and the horizontal attenuation time/div is set at 50<math>\mu</math>s, calculate the value of:<br/> <i>Rajah A2(c) menunjukkan satu bentuk gelombang segitiga yang dipaparkan pada skrin sebuah osiloskop. Sekiranya vertical attenuation volt/div ditetapkan pada 2 V/div dan horizontal attenuation time/div ditetapkan pada 50 <math>\mu</math>s/div, hitung nilai berikut:</i></p> <ul style="list-style-type: none"> <li>i. peak-to-peak voltage (<math>V_{pp}</math>)<br/> <i>voltan puncak ke puncak (<math>V_{pp}</math>)</i></li> <li>ii. peak voltage (<math>V_p</math>)<br/> <i>voltan puncak (<math>V_p</math>)</i></li> <li>iii. RMS voltage (<math>V_{rms}</math>)<br/> <i>voltan RMS (<math>V_{rms}</math>)</i></li> <li>iv. time of 1 cycle (T)<br/> <i>tempoh 1 kitaran (T)</i></li> <li>v. frequency (f) of the signal.<br/> <i>isyarat frekuensi (f)</i></li> </ul> |

Figure A2(c) / *Rajah A2(c)*

[10 marks]

[10 markah]

## QUESTION 3

## SOALAN 3

- |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLO1 | <p>(a) State <b>TWO (2)</b> advantages and <b>TWO (2)</b> disadvantages of a digital oscilloscope.<br/><i>Nyatakan <b>DUA (2)</b> kelebihan dan <b>DUA (2)</b> kekurangan bagi osiloskop digital.</i></p> <p style="text-align: right;">[4 marks]<br/>[4 markah]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CLO1 | <p>(b) Explain the step-by-step procedure to calibrate an analogue oscilloscope before taking measurements.<br/><i>Jelaskan langkah demi langkah prosedur untuk menentukur osiloskop analog sebelum membuat pengukuran.</i></p> <p style="text-align: right;">[6 marks]<br/>[6 markah]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| CLO1 | <p>(c) A square wave signal with a frequency of 1kHz and a peak-to-peak voltage of 8V is applied to an oscilloscope. With settings of 2V/div and 0.5ms/div, the oscilloscope is configured. Utilize a fully labeled square waveform to calculate the time (T) and peak-to-peak voltage (<math>V_{pp}</math>) divisions.<br/><i>Satu isyarat gelombang segi empat dengan frekuensi 1kHz dan voltan puncak ke puncak sebanyak 8V dikenakan kepada sebuah osiloskop. Dengan tetapan 2V/div dan 0.5ms/div, osiloskop tersebut dilaraskan. Gunakan bentuk gelombang segi empat yang lengkap berlabel untuk mengira pembahagian tempoh masa (T) dan pembahagian voltan puncak ke puncak (<math>V_{pp}</math>).</i></p> <p style="text-align: right;">[10 marks]<br/>[10 markah]</p> |

**QUESTION 4****SOALAN 4**

- CLO1 (a) List **TWO (2)** conditions that must be considered when the Wheatstone Bridge is in balance condition.  
*Senaraikan **DUA (2)** keadaan yang perlu dipertimbangkan apabila Tetimbang Wheatstone berada dalam keadaan seimbang.*
- [4 marks]  
[4 markah]
- CLO1 (b) KWH meter is a device that used to measure the amount of electrical energy consumed in a building. Explain briefly the **THREE (3)** systems involved in construction of KWH meter.  
*Meter KWH ialah peranti yang digunakan untuk mengukur jumlah tenaga elektrik yang digunakan di dalam sesebuah bangunan. Terangkan secara ringkas **TIGA (3) sistem** yang terlibat dalam pembinaan meter KWH.*
- [6 marks]  
[6 markah]
- CLO1 (c) The Wheatstone Bridge is shown in Figure A4(c). Derive the equation for the Wheatstone Bridge when in balance and calculate  $R_x$ . Given the value of resistance  $R_1=100\Omega$ ,  $R_2=1000\Omega$  and  $R_3=400\Omega$ .  
*Tetimbang Wheatstone ditunjukkan dalam Rajah A4(c). Terbitkan persamaan untuk Tetimbang Wheatstone apabila dalam keadaan seimbang dan kira  $R_x$ . Diberi nilai rintangan  $R_1=100\Omega$ ,  $R_2=1000\Omega$  dan  $R_3=400\Omega$ .*

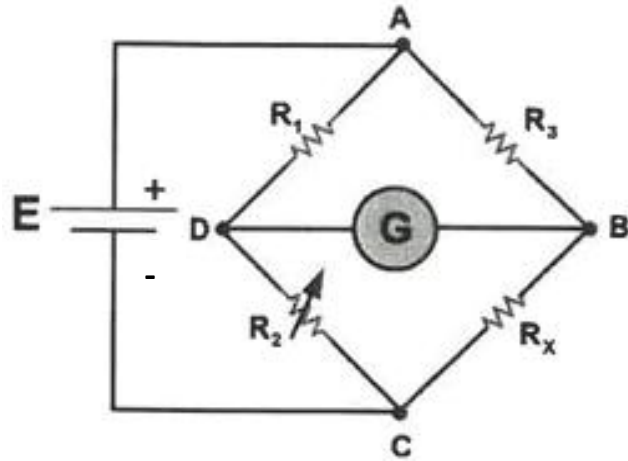


Figure A4(c) / Rajah A4(c)

[10 marks]

[10 markah]

**SECTION B: 20 MARKS****BAHAGIAN B: 20 MARKAH****INSTRUCTION:**

This section consists of **ONE (1)** essay question. Answer the questions.

**ARAHAN:**

*Bahagian ini mengandungi **SATU (1)** soalan esei. Jawab soalan tersebut.*

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

CLO1

There are two types of ohmmeters which are Series and Shunt Ohmmeter. A Series Ohmmeter is to use to measure high value of resistance while A Shunt Ohmmeter is use to measure low value of resistance. The Series Ohmmeter circuit consists of voltage source, current limiting resistor, zero adjust resistor, meter resistor and unknown resistor.

The total resistance of  $R_1$ ,  $R_2$  and  $R_m$  for Series Ohmmeter is  $25k\Omega$  and the supply is 4V. Calculate the full-scale deflection current ( $I_{FSD}$ ) if the unknown resistance  $R_X = 0\Omega$ . Compute the value of  $R_X$  if the ohmmeter scale is at  $\frac{1}{4} I_{FSD}$ ,  $\frac{1}{2} I_{FSD}$ ,  $\frac{3}{4} I_{FSD}$  and  $I_{FSD}$ .

*Terdapat dua jenis Ohmmeter iaitu Siri dan Ohmmeter Pirau. Ohmmeter Siri digunakan untuk mengukur nilai rintangan yang tinggi manakala Ohmmeter Pirau digunakan untuk mengukur nilai rintangan yang rendah. Litar Ohmmeter Siri terdiri daripada punca voltan, perintang penghad arus, perintang pelarasan sifar, perintang meter dan perintang yang tidak diketahui.*

*Jumlah rintangan  $R_1$ ,  $R_2$  dan  $R_m$  untuk Ohmmeter Siri ialah  $25k\Omega$  dan bekalannya ialah 4V. Hitung arus pesongan skala penuh ( $I_{FSD}$ ) jika rintangan yang tidak diketahui  $R_X = 0\Omega$ . Kira nilai  $R_X$  jika skala ohmmeter pada  $\frac{1}{4} I_{FSD}$ ,  $\frac{1}{2} I_{FSD}$ ,  $\frac{3}{4} I_{FSD}$  dan  $I_{FSD}$ .*

[20 marks]

[20 markah]

**SOALAN TAMAT**