

**SULIT**



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

**JABATAN KEJURUTERAAN ELEKTRIK**

**PEPERIKSAAN AKHIR  
SESI DISEMBER 2015**

**DEE1012: MEASUREMENT**

---

**TARIKH : 7 APRIL 2016  
MASA : 8.30 AM – 10.30 AM (2 JAM)**

---

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Objektif (10 soalan)

Bahagian B: Struktur (4 soalan)

Bahagian C: Esei (2 soalan)

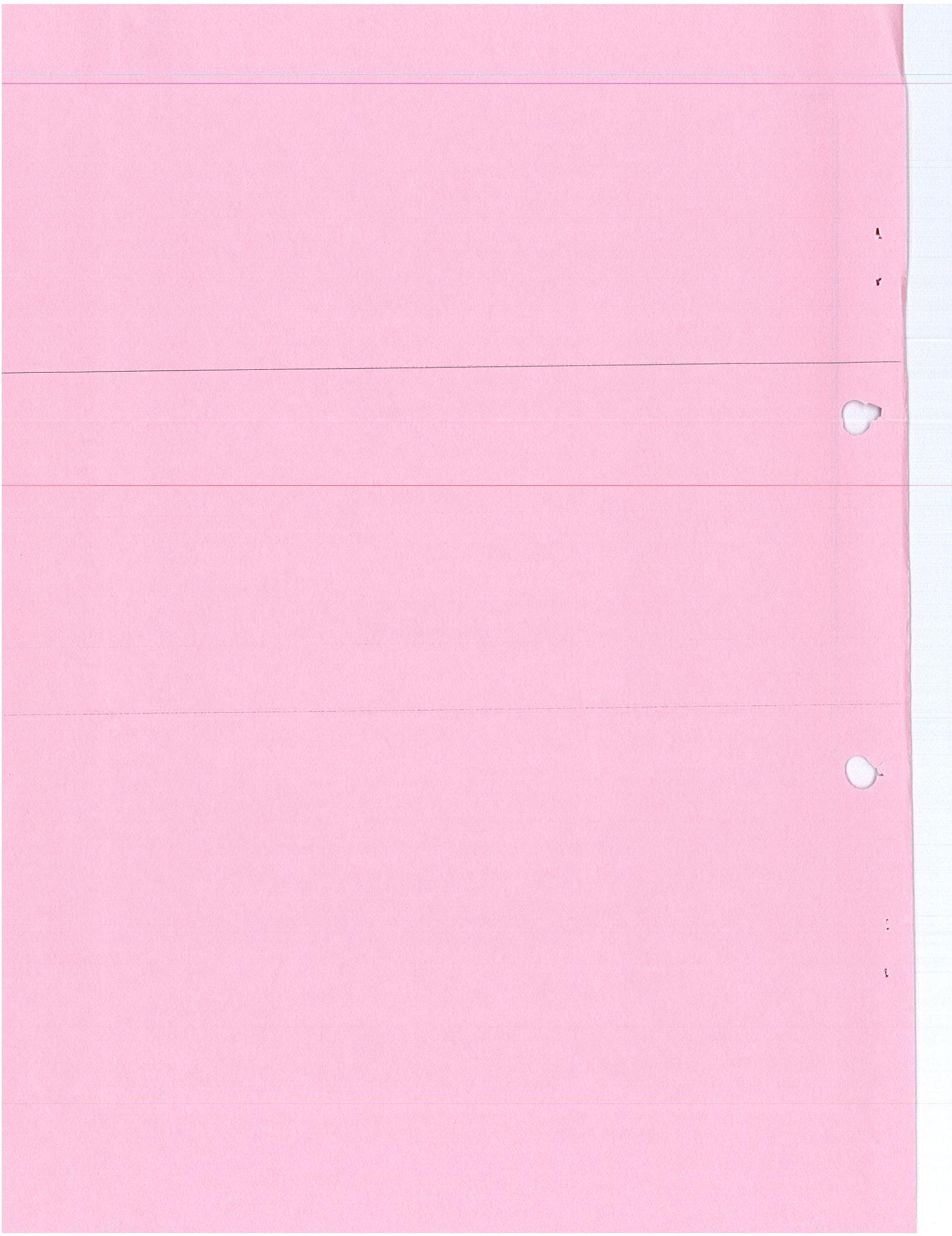
Dokumen sokongan yang disertakan : Tiada

---

**JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

**SULIT**



**SECTION A: 10 MARKS****BAHAGIAN A: 10 MARKAH****INSTRUCTION:**

This section consists of TEN (10) objective questions. Mark your answers in the OMR form provided.

**ARAHAN:**

Bahagian ini mengandungi SEPULUH (10) soalan objektif. Tandakan jawapan anda di dalam borang OMR yang disediakan.

CLO1  
C1

1. Identify the answer that expresses the percentage error.  
*Kenalpasti jawapan yang menyatakan ralat peratusan.*

- A. Relative error  
*Ralat Relatif*
- B. Absolute error  
*Ralat Mutlak*
- C. Gross error  
*Ralat kasar*
- D. Systematic error  
*Ralat Sistematik*

CLO1  
C2

2. The expected value of the voltage across a resistor is 50V. However, the measurement yields a value of 49V. Calculate the absolute error.

*Anggaran nilai voltan merentasi perintang adalah 50V; walau bagaimanapun, pengukuran menghasilkan nilai 49V. Kira ralat mutlak.*

- |           |           |
|-----------|-----------|
| A. 10.0 V | B. 0.1 V  |
| C. 1.0 V  | D. 1.0 mV |

CLO1  
C2

3. Identify the multiplier resistance for DC voltmeter with sensitivity of  $1\text{K}\Omega/\text{V}$  and range 0 -15V.

*Kenalpasti nilai rintangan pendarab untuk meter voltan AT dengan kepekaan  $1\text{K}\Omega/\text{V}$  dan 0 -15V.*

- A.  $1.5 \text{ K}\Omega$
- B.  $15 \text{ K}\Omega$
- C.  $150 \Omega$
- D.  $15\Omega$

CLO2  
C3

4. A basic D'Arsonval movement with a full scale deflection of 100mA and internal resistance of  $300\Omega$  is used as a voltmeter. Calculate the value of the multiplier resistance needed to measure a voltage range of 0-100V.

*Satu meter pergerakan asas D'Arsonval dengan pesongan skala penuh 100mA dan rintangan dalam  $300\Omega$  digunakan sebagai meter voltan. Kirakan nilai rintangan pendarab yang diperlukan untuk mengukur julat voltan 0-100V.*

- |                       |                      |
|-----------------------|----------------------|
| A. $750 \Omega$       | C. $700\Omega$       |
| B. $1\text{k }\Omega$ | D. $7\text{k}\Omega$ |

CLO1  
C3

5.

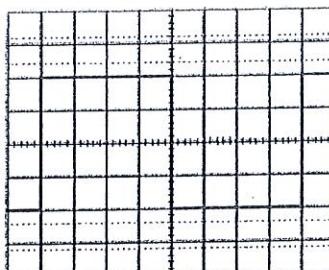


Figure A1 / Rajah A1

Based on Figure A1, calculate the value of frequency (f) if the Volt/div = 5V and Time/div = 2ms.

*Berdasarkan Rajah A1, kirakan nilai bagi frekuensi (f) jika Volt/div = 5V dan Time/div = 2ms*

- A. 72Hz
- B. 62.5Hz
- C. 0.072Hz
- D. 0.062Hz

CLO1  
C2

6. Oscilloscopes are used in the science, medicine, engineering and telecommunication industries. Choose which statements are **TRUE**.

*Osiloskop digunakan dalam industri sains, perubatan, kejuruteraan dan telekomunikasi. Pilih pernyataan manakah yang **BETUL**.*

- i. It is used for give the visual representation in a radar application  
*Ia digunakan dalam aplikasi radar untuk memaparkan isyarat visual.*
  - ii. It is used to trace and measure a signal throughout the RF, IP and AP channels of radio and television receiver.  
*Ia digunakan untuk mengukur dan menjelaki isyarat melalui saluran RF,IP dan AP pada penerima radio dan television.*
  - iii. It is used to determine the modulation characteristics to detect the waves in transmission line  
*Ia digunakan untuk mengenalpasti ciri-ciri modulasi pada gelombang dalam talian penghantara*
  - iv. It is used to measure capacitance, inductance and also used to check the diode.  
*Ia digunakan untuk mengukur nilai kemauatan, kearuhan dan juga digunakan untuk memeriksa diod.*
- A. i,ii and iii
  - B. i, iii and iv
  - C. i,ii and iv
  - D. i,ii,iii and iv

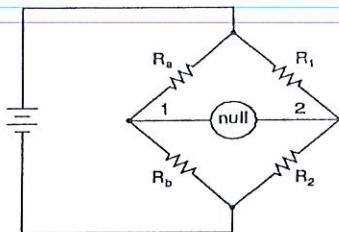


Figure A2/Rajah A2

CLO1  
C1

7. Identify the types of bridge in Figure A2 above.  
*Kenalpasti jenis tetimbang dalam Rajah A2 di atas.*

A. Kelvin Bridge  
B. Wheatstone Bridge

C. Maxwell Bridge  
D. Galvanometer Bridge

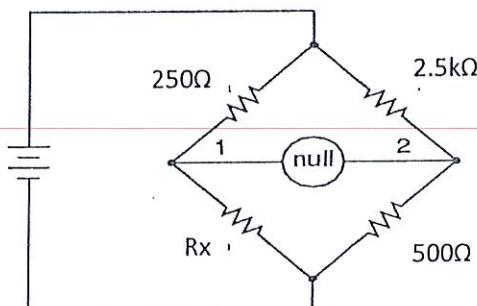


Figure A3/ Rajah A3

CLO1  
C2

8. Calculate the value of Rx in Figure A3 above.  
*Kirakan nilai Rx dalam Rajah A3 di atas.*

A. 1250Ω  
B. 250Ω

C. 50Ω<sup>1</sup>  
D. 5kΩ

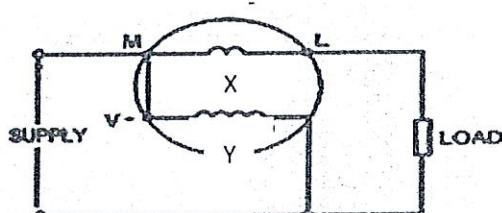


Figure A4 / Rajah A4

CLO1  
C2

9. Identify coil that are labeled with X and Y for analogue wattmeter circuit in Figure A4 above.  
*Kenalpasti gegelung yang dilabel dengan X dan Y bagi litar wattmeter analog dalam Rajah A4 di atas.*

	Coil X /Gegelung X	Coil Y/ Gegelung Y
A.	Current/ Arus	Permanent/ Kekal
B.	Current/ Arus	Voltage/ Voltan
C.	Voltage /Voltan	Current /Arus
D.	Permanent /Kekal	Power /Kuasa

CLO2  
C3

10. Choose a suitable meter for measuring the amount of electric power used.  
*Pilih meter yang sesuai digunakan untuk mengukur jumlah kuasa elektrik.*
- i. Wattmeter  
*Meter watt*
  - ii. Volt meter  
*Meter volt*
  - iii. KWH Meter  
*Meter KWH*
  - iv. Power Meter  
*Meter Kuasa*
- A. i, ii, iii  
B. ii,iii,iv  
C. iii and iv  
D. i,iii,iv

**SECTION B: 60 MARKS**  
**BAHAGIAN B: 60 MARKAH****INSTRUCTION:**

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

**ARAHAN:**

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

**QUESTION 1**  
**SOALAN 1**CLO1  
C1

- (a) Define measurement.

*Beri definisi Pengukuran.*

[3 marks]

[3 markah]

CLO1  
C2

- (b) Explain the terminology of scale and range.

*Terangkan terminologi bagi skala dan julat.*

[6 marks]

[6 markah]

CLO1  
C2

- (c) Explain the characteristics of measurement for accuracy and precision.

*Terangkan ciri-ciri ketepatan dan kejituhan dalam pengukuran.*

[6 marks]

[6 markah]

**QUESTION 2**  
**SOALAN 2**CLO1  
C1

- (a) Describe basic principle of DC and AC Meter.

*Jelaskan prinsip asas Meter AT dan AU.*

[3 marks]

[3 markah]

CLO2  
C3

- (b) Calculate the value of the multiplier resistance for the multiple range DC voltmeter circuit shown in Figure B 2(b) if  $I_m = 100\mu A$  and  $R_m = 10k\Omega$ .  
*Kirakan nilai perintang pelbagai untuk julat pelbagai dalam litar meter volt AT dalam Rajah B 2(b) jika diberi  $I_m = 100\mu A$  dan  $R_m = 10k\Omega$ .*

[6 marks]

[6 markah]

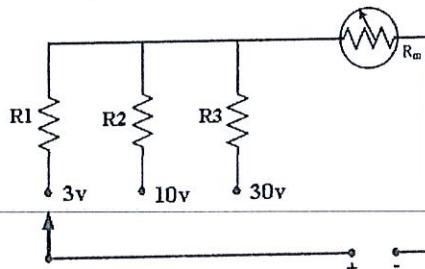


Figure B 2(b)/ Rajah B 2(b)

CLO2  
C3

- (c) With the aid of a diagram, describe the basic construction and operating principle of Permanent Magnet Moving Coil (PMMC).  
*Dengan bantuan gambarajah, jelaskan binaan asas dan prinsip operasi bagi Magnet Kekal Gelung Bergerak (MKGB).*

[6 marks]

[6 markah]

### QUESTION 3

### SOALAN 3

CLO1  
C1

- (a) Describe the basic functions of analogue and digital oscilloscope.  
*Jelaskan fungsi-fungsi asas osiloskop analog dan digital.*

[3 marks]

[3 markah]

CLO2  
C3

- (b) Refer to Figure B 3(b), determine the peak to peak voltage ( $V_{PP}$ ), the peak voltage ( $V_p$ ) and frequency if the Volt/div control is adjusted at 0.5V and Time/div control is adjusted at 50 $\mu s$ .

Merujuk kepada Rajah B 3(b) , tentukan nilai voltan puncak ke puncak ( $V_{PP}$ ), voltan puncak ( $V_p$ ) dan frekuensi jika pelaras Volt/div dilaraskan pada  $0.5V$  dan pelaras Time/div dilaraskan pada  $50\mu s$ .

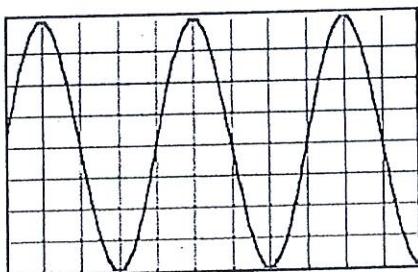


Figure B 3(b) / Rajah B 3(b)

[6 marks]

[6 markah]

CLO2  
C3

- (c) An oscilloscope with Volt/div and Time/div is set to  $5mV/div$  and  $20\mu sec/div$  respectively and is used to measure two input signals. Figure B3(c) shows the displayed waveform. Calculate Peak to peak voltage ( $V_{pp}$ ), period 1 cycle( $T$ ) and phase angle ( $\theta$ ) for both waveform A and B.

Osiloskop dengan Volt/div dan Time/div ditetapkan pada  $5mV/div$  and  $20\mu sec/div$  dan ia digunakan untuk mengukur dua isyarat masukan. Rajah B3(c) ditunjukkan dalam gelombang yang dipaparkan. Kirakan Voltan puncak ke puncak ( $V_{pp}$ ), Tempoh 1kitar lengkap ( $T$ ) dan beza fasa ( $\theta$ ) untuk gelombang A dan B.

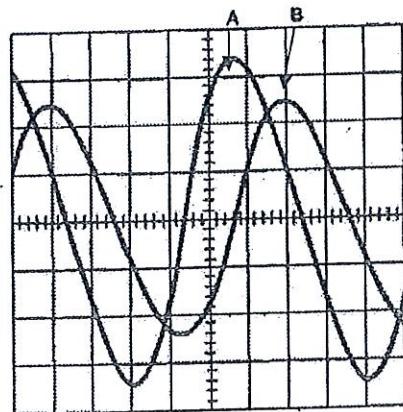


Figure B3(c) / Rajah B3(c)

[6 marks]

[6 markah]

SULIT

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

- (a) Define power meters.

*Beri definisi Meter Kuasa.*

[3 marks]

[3 markah]

- (b) Describe basic principle of analogue wattmeter with construction of electrodynamometer.

*Jelaskan prinsip asas meter watt analog dengan binaan meter dynamo Elektro.*

[5 marks]

[5 markah]

- (c) Illustrate the application of clamp meters in measuring alternating current with a suitable diagram.

*Ilustrasikan penggunaan meter clamp dalam mengukur arus ulang alik dengan gambarajah yang sesuai.*

[7 marks]

[7 markah]

**SECTION C: 30 MARKS**  
**BAHAGIAN C: 30 MARKAH****INSTRUCTION:**

This section consists of TWO (2) essay questions. Answer ALL questions.

**ARAHAN:**

Bahagian ini mengandungi DUA (2) soalan eseai. Jawab SEMUA soalan.

**QUESTION 1****SOALAN 1**CLO2  
C3

Permanent Magnet Movement Coil(PMMC) instrument with an internal resistance of  $10\Omega$  and a full scale deflection current of  $10mA$  is to be used in the design of multirange DC voltmeter with voltage ranges of  $0-10V$  and  $0-25V$ . Sketch the circuit and express the equations of multiplier resistor. From the equations, calculate the value of the multiplier resistors.

Sebuah instrumen Gegelung Bergerak Magnet Kekal (GBMK) dengan rintangan dalaman  $10\Omega$  dan pesongan semasa skala penuh  $10mA$  digunakan dalam rekabentuk meter voltan AT pelbagai julat dengan julat voltan  $0-10V$  dan  $0-25V$ . Lukiskan litar tersebut dan nyatakan persamaan perintang pendarab . Dari persamaan, kira nilai perintang pendarab.

[15marks]

[15 markah]

**QUESTION 2****SOALAN 2**CLO2  
C3

A stable Wheatstone bridge consists of a network of four resistance arms which are  $R_1$ ,  $R_2$ ,  $R_3$  and  $R_X$ . A current is applied to two opposite junctions. The current detector is connected to the other two junctions. Given that the value of  $R_1 = 4k\Omega$ ,  $R_2 = 12k\Omega$  and  $R_3 = 8k\Omega$ . Draw and label the Wheatstone bridge completely. Express the bridge balance equation for  $R_X$  and calculate the value of  $R_X$ . If  $R_2$  is two times the value of  $R_1$ , find the new value of  $R_X$ .

Tetimbang Wheatstone stabil terdiri daripada satu rangkaian yang mempunyai empat rintangan iaitu  $R_1$ ,  $R_2$ ,  $R_3$  dan  $R_x$ . Arus dikenakan ke atas dua persimpangan bertentangan. Pengesan arus disambungkan kepada dua persimpangan lain. Diberi nilai  $R_1 = 4k\Omega$ ,  $R_2 = 12k\Omega$  dan  $R_3 = 8k\Omega$ . Lukis dan labelkan tetimbang Wheatstone dengan lengkap. Nyatakan persamaan bagi perintang  $R_x$  dan kira nilai  $R_x$ . Jika  $R_2$  adalah dua kali ganda nilai  $R_1$ , cari nilai  $R_x$  yang baru.

[15 marks]

[15 markah]

SOALAN TAMAT