POLITEKNIK
MALAYSIA

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 SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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 1KΩ/V and range 0 -15V.
   Kenalpasti nilai rintangan pendarab untuk meter voltan AT dengan kepekaan 1KΩ/V dan 0 -15V.

   A.   1.5 KΩ
   B.   15 KΩ
   C.   150 Ω
   D.   15Ω

CLO2
C3

4. A basic D'Arsonval movement with a full scale deflection of 100mA and internal resistance of 300Ω 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 300Ω digunakan sebagai meter voltan. Kirakan nilai rintangan pendarab yang diperlukan untuk mengukur julat voltan 0-100V.

   A. 750 Ω   C. 700Ω
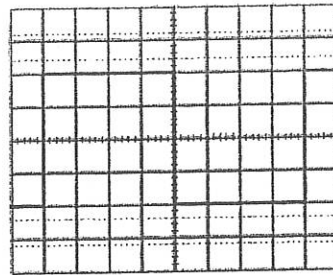   B. 1k Ω   D. 7kΩ

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 frekuansi (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 penyataan 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 menjejaki 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 kemuatan, kearuhan dan juga digunakan untuk memeriksa diod.

A. i,ii and iii
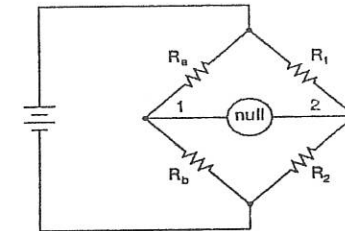B. i, iii and iv
C. i,ii and iv
D. i,ii,iii and iv

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   C. Maxwell Bridge
B. Wheatstone Bridge   D. Galvanometer Bridge
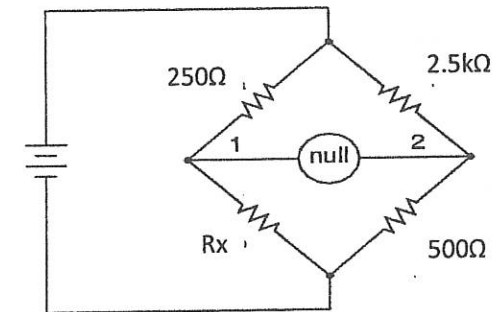

Figure A3/ *Rajah A3*

CLO1
C2

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

A. 1250Ω   C. 50Ω
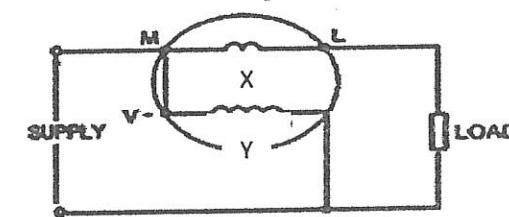B. 250Ω   D. 5kΩ

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 kejituan 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 Im= 100µA and Rm = 10kΩ.

Kirakan nilai perintang pelbagai untuk julat pelbagai dalam litar meter volt AT dalam Rajah B 2(b) jika diberi Im= 100µA dan Rm = 10kΩ.
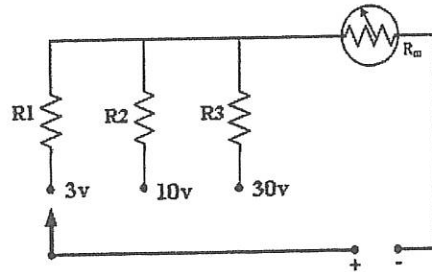
[6 marks]

[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 50µs.

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 50µs.
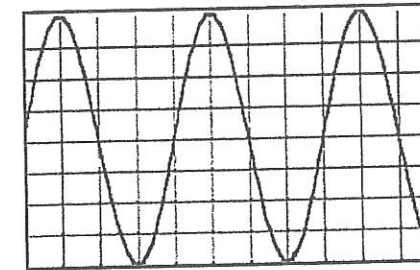

Figure B 3(b)/ *Rajah* B 3(b)

[6 marks]

[6 markah]

CLO2
C3

(c) An oscilloscope with Volt/div and Time/div is set to 5mV/div and 20µsec/div respectively and is used to measure two input signals. Figure B3(c) shows the displayed waveform. Calculate Peak to peak voltage (Vpp), period 1 cycle(T) and phase angle (θ) for both waveform A and B.

Osiloskop dengan Volt/div dan Time/div ditetapkan pada 5mV/div and 20µsec/div dan ia digunakan untuk mengukur dua isyarat masukan. Rajah B3(c) ditunjukkan dalam gelombang yang dipaparkan. Kirakan Voltan puncak ke puncak (Vpp), Tempoh 1kitar lengkap (T) dan beza fasa (θ) untuk gelombang A dan B.
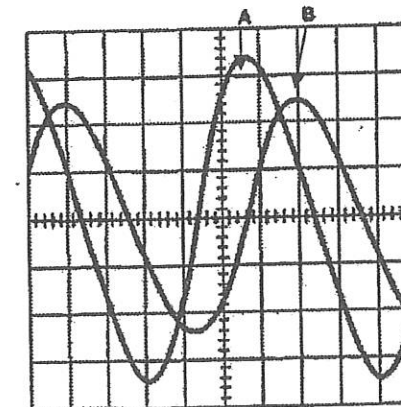

Figure B3(c) / *Rajah B3(c)*

[6 marks]

[6 markah]

QUESTION 4
SOALAN 4

CLO1
C1

(a)   Define power meters.

Beri definisi Meter Kuasa.

[3 marks]

[*3 markah*]

CLO1
C3

(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*]

CLO2
C3

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

Ilustrasikan pengunaan 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 esei. Jawab SEMUA soalan.

QUESTION 1
SOALAN 1

CLO2
C3

Permanent Magnet Movement Coil(PMMC) instrument with an internal resistance of 10Ω 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 10Ω 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 R1, R2, R3 and RX. A current is applied to two opposite junctions. The current detector is connected to the other two junctions. Given that the value of R1 = 4kΩ, R2 = 12kΩ and R3 = 8kΩ. Draw and label the Wheatstone bridge completely. Express the bridge balance equation for RX and calculate the value of RX. If R2 is two times the value of R1, find the new value of Rx.

Tetimbang Wheatstone stabil terdiri daripada satu rangkaian yang mempunyai empat rintangan iaitu R1, R2, R3 dan Rx. Arus dikenakan ke atas dua persimpangan bertentangan. Pengesan arus disambungkan kepada dua persimpangan lain. Diberi nilai R1 = 4kΩ, R2 = 12kΩ dan R3 = 8kΩ. Lukis dan labelkan tetimbang Wheatstone dengan lengkap. Nyatakan persamaan bagi perintang Rx dan kira nilai Rx. Jika R2 adalah dua kali ganda nilai R1, cari nilai Rx yang baru.

[15 marks]

[15 markah]

SOALAN TAMAT