

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2015

EE301: ELECTRONIC CIRCUITS

TARIKH : 29 OKTOBER 2015

MASA : 2.30 PM – 4.30 PM (2 JAM)

Kertas ini mengandungi **SEMBILAN BELAS (19)** halaman bercetak.

Bahagian A: Objektif (20 soalan)

Bahagian B: Struktur (10 soalan)

Bahagian C: Esei (2 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SULIT

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

This section consists of **TWENTY (20)** objective questions. Mark your answers in the OMR form provided.

ARAHAN :

Bahagian ini mengandungi DUA PULUH (20) soalan objektif. Tandakan jawapan anda di dalam borang OMR yang disediakan.

CLO1
C1

1. State the function of filter in the linear DC power supply

Nyatakan fungsi penapis dalam bekalan kuasa lehrus AT

- A. To convert the AC voltage to pulsating DC voltage.
Menukar voltan AU kepada voltan dedenyut AT.
- B. To smooth out the voltage from rectifier output.
Melicinkan voltan daripada keluaran penerus.
- C. To maintain a constant DC voltage of power supply output.
Mengekalkan voltan AT pemalar keluaran bekalan kuasa.
- D. To increase the output voltage of rectifier.
Meningkatkan voltan keluaran penerus.

CLO1
C3

2.

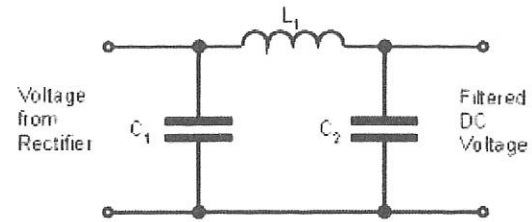


Figure A2/Rajah A2

Figure A2 shows an π filter circuit. The π filter is used to reduce a ripple voltage from the rectifier. All statement is **TRUE** about the characteristics of π filter, **EXCEPT**:

Rajah A2 menunjukkan litar penapis π . Penapis π digunakan untuk mengurangkan voltan riak daripada penerus. Semua kenyataan adalah **BENAR** tentang ciri-ciri penapis π **KECUALI**:

- A. Most of the remaining ripple is reduced by the combination of L_1 and C_2 .
Kebanyakan saki baki voltan riak dikurangkan dengan gabungan L_1 dan C_2 .
- B. The capacitor C_1 provides low impedance to ripple voltage.
Kapasitor C_1 menyediakan galangan rendah terhadap voltan riak.
- C. The inductor L_1 provides high impedance to AC ripple voltage.
Pengaruh L_1 menyediakan galangan tinggi terhadap voltan riak AU.
- D. The value of C_1 is small to provide low impedance to DC voltage.
Nilai C_1 adalah kecil untuk menghasilkan galangan rendah terhadap voltan AT.

CLO1
C1

3. The Integrated Circuit (IC) regulator 7912 produces a regulated output voltage of _____ in the linear Direct Current (DC) power supply.

Pengatur IC 7912 menghasilkan voltan keluaran teratur _____ dalam bekalan kuasa le lurus AT.

- A. 7 V
- B. 9 V
- C. 12 V
- D. -12 V

CLO1
C2

4.

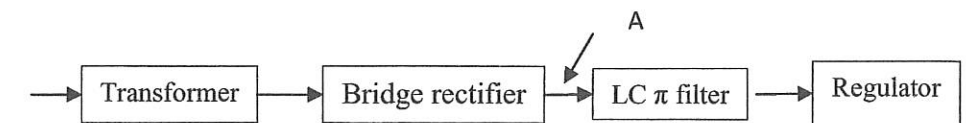
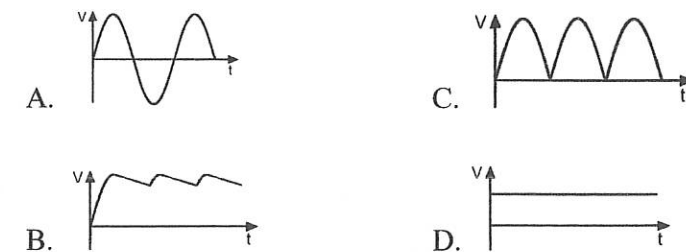


Figure A4/ Rajah A4

Based on Figure A4, choose the correct waveform at point A .

Berdasarkan rajah A4, pilih bentuk gelombang yang betul pada titik A.



CLO1
C3

5 Refer to Figure A5 below, calculate the value of the resonant frequency.

Merujuk kepada Rajah A5 di bawah, kirakan frekuensi resonan bagi litar tersebut.

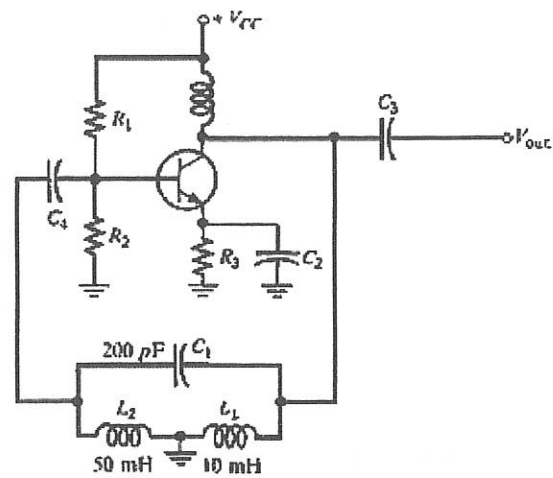


Figure A5 / Rajah A5

- A. 123.4 kHz
- B. 61.7 kHz
- C. 45.94 kHz
- D. 23.1 kHz

CLO1
C1

6. Colpitt and Hartley are refer to _____

Colpitts dan Hartley merujuk kepada _____

- A. types of RC oscillators
Jenis-jenis pengayun jenis RC
- B. inventors of the transistor
pencipta komponen transistor
- C. types of LC oscillators
Jenis-jenis pengayun LC
- D. types of filters
jenis-jenis penapis

CLO1
C1

7. Identify which of the following characteristic that **DOES NOT** apply to an operational amplifier.

*Kenalpasti ciri berikut yang **TIDAK DIGUNAKAN** bagi penguat kendalian.*

- A. High gain/ *Gandaan tinggi*
- B. Low power/ *Kuasa rendah*
- C. High input impedance/ *Galangan masukan tinggi*
- D. Low output impedance/ *Galangan keluaran rendah*

CLO1
C2

8. The feedback path in an operational amplifier differentiator consists of _____.

Laluan suapbalik di dalam penguat kendalian pembezaan terdiri daripada _____.

- A. a resistor/ *perintang*
- B. a capacitor/ *peraruh*
- C. a resistor and a capacitor in series/ *perintang dan peraruh sesiri*
- D. a resistor and a capacitor in parallel/ *perintang dan peraruh selari*

CLO1
C1

9. Figure A9 shows the block diagram of OP-AMP, identify X.
Rajah A9 menunjukkan gambarajah blok bagi OP-AMP, kenalpasti X.

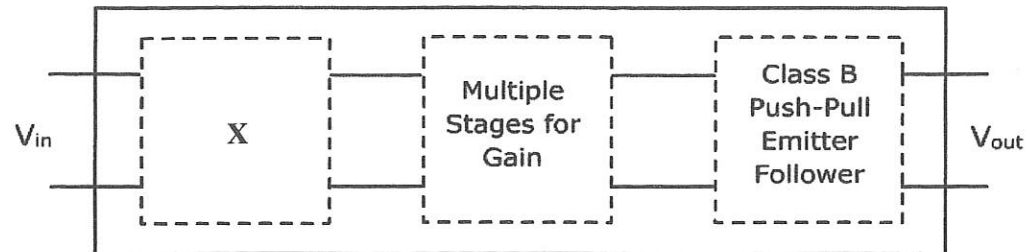


Figure A9 / Rajah A9

- A. Transistor/Transistor
B. Operational Amplifier/Penguat Kendalian
C. Differential Amplifier/Penguat Pembezaan
D. Gain Amplifier/Penguat Gandaan

CLO1
C1

10. The ideal input impedance for an operational amplifier is _____
Ciri unggul untuk galangan masukan bagi penguat kendalian ialah _____

- A. $\infty \Omega$
B. 0Ω
C. 1Ω
D. $500 \text{ k}\Omega$

CLO1
C1

11. A monostable 555 timer has _____ number of stable states.
Satu pemasa monostabil 555 mempunyai _____ keadaan stabil.

- A. 0
B. 1
C. 2
D. 3

CLO1
C2

12. Choose the **CORRECT** mode of 555 timer for Figure A12.
Pilih mod pemasa 555 yang **BETUL** bagi Rajah A12.

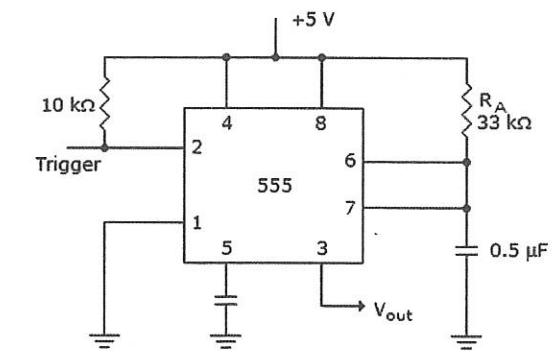


Figure A12/ Rajah A12

- A. Monostable/Monostabil
B. Astable/Astabil
C. Bistable/Bistabil
D. Schmitt Trigger/Schmitt Trigger

CLO1
C3

13. Calculate the duty cycle of the waveform at the output of the circuit at Figure A13.

Kirakan kitar kerja bagi gelombang keluaran untuk litar pada Rajah A13.

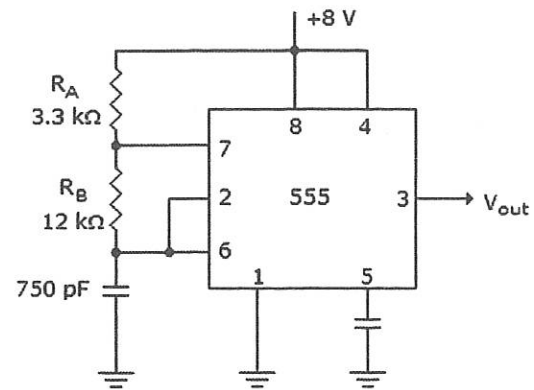
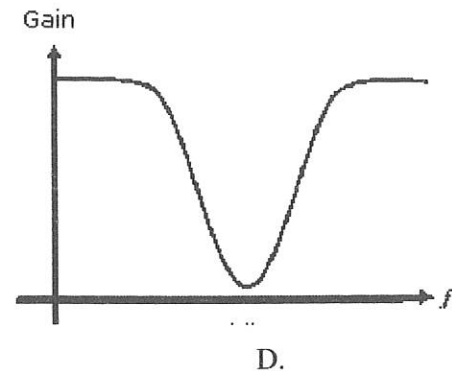
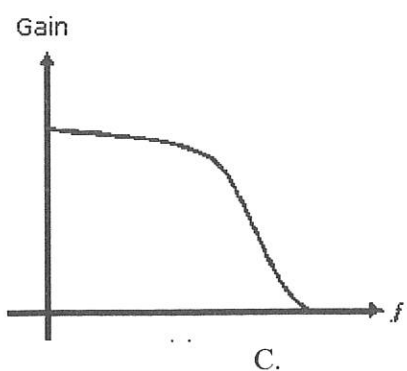
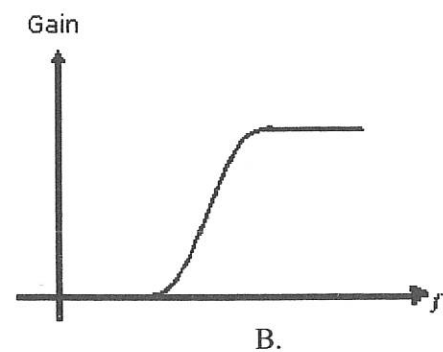
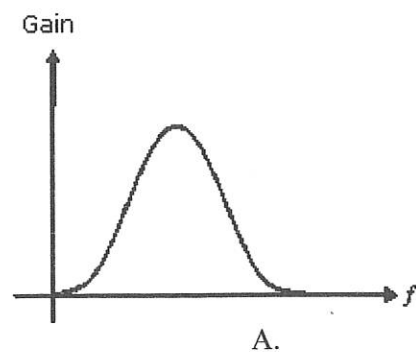


Figure A13/ Rajah A13.

- A. 78%
- B. 56%
- C. 50%
- D. 44%

CLO1
C1

- 14 Identify the frequency response curve for a High-Pass Filter.
Kenal pasti lengkung frekuensi sambutan untuk satu Penapis Lulus Tinggi



CLO1
C1

15. State the type of filter shown in Figure A15 below.
Nyatakan jenis penapis bagi Rajah A15 di bawah.

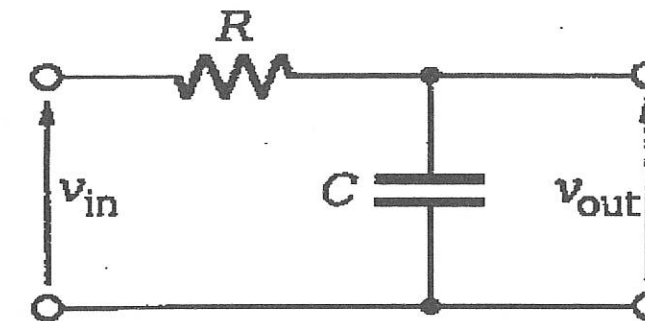


Figure A15 / Rajah A15

- A. Active Low-Pass Filter/ *Penapis Aktif Lulus Rendah*
- B. Passive Low-Pass Filter/ *Penapis Pasif Lulus Rendah*
- C. Passive High-Pass Filter/ *Penapis Pasif Lulus Tinggi*
- D. Active High-Pass Filter/ *Penapis Aktif Lulus Tinggi*

CLO1
C2

16. An amplifier has an input voltage of 10V and an output voltage of 100V. Calculate the voltage gain of the amplifier in decibel (dB).

Satu penguat mempunyai voltan masukan iaitu 10V dan voltan keluaran sebanyak 100V. Kirakan gandaan voltan bagi penguat tersebut dalam decibel (dB).

- A. 20 dB
- B. 25 dB
- C. 15 dB
- D. 10 dB

CLO1
C2

- 17 Choose the **TRUE** statements about Digital to Analog Converter (DAC).
*Pilih pernyataan yang **BETUL** tentang Penukar Digital ke Analog (DAC).*

- A. An electronic device that converts a digital data to an analog voltage or current.
Alat elektronik yang menukarkan data digital kepada voltan atau arus analog.
- B. An electronic device that converts an analog data to a digital voltage or current.
Alat elektronik yang menukarkan data analog kepada voltan atau arus digital.
- C. An electronic device that converts AC to DC signal.
Alat elektronik yang menukarkan isyarat AU kepada isyarat AT.
- D. An electronic device that converts DC to AC signal.
Alat elektronik yang menukarkan isyarat AT kepada isyarat AU.

CLO1
C3

18. A Binary-weighted Digital to Analog Converter (DAC) has an input resistor of $100k\Omega$. If the resistor is connected to a 5V source, calculate the current through that resistor.

Sebuah penukar 'Binary-weighted digital' kepada analog mempunyai satu perintang masukan $100k\Omega$. Jika perintang tersebut disambungkan kepada sumber 5V, kirakan arus yang melalui perintang tersebut.

- A. $50\mu\text{A}$ C. 50mA
B. 5mA D. $500\mu\text{A}$

CLO1
C2

- 19 The number of Binary bits at the input of a Digital to Analog Converter (DAC) is known as _____.

Bilangan bit binary pada masukan penukar digital kepada analog (DAC) dikenali sebagai _____.

- A. accuracy/ ketepatan
B. linearity/kelinearan
C. resolution/resolusi
D. monotocity/monotositi

CLO1
C2

20. Calculate the percentage resolution of a 0V – 5V of 6-bit Digital to Analog Converter (DAC).

Kirakan peratus resolusi bagi 0V – 5V untuk 6-bit penukar digital kepada analog (DAC).

- A. 63%.
B. 64%
C. 1.56%
D. 15.6%

SECTION B : 30 MARKS

BAHAGIAN B : 30 MARKAH

INSTRUCTION:

This section consists of **TEN (10)** structured questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi **SEPULUH (10)** soalan berstruktur. Jawab semua soalan.

CLO1
C1

QUESTION 1

List **THREE (3)** types of regulator that are used in linear Direct Current (DC) power supply.

SOALAN 1

Senaraikan **TIGA (3)** jenis regulator yang digunakan dalam bekalan kuasa lurus AT.

[3 marks]
[3 markah]

CLO1
C1

QUESTION 2

A ripple voltage is a small unwanted signal in linear Direct Current (DC) power supply that is produce from the output of a filter.

- Define the ripple voltage.
- State **TWO (2)** factors that influences the ripple voltage.

SOALAN 2

Voltan riak ialah isyarat kecil yang tidak diingini dalam bekalan kuasa lurus AT yang dihasilkan pada keluaran penapis.

- Definisikan voltan riak.
- Nyatakan **DUA (2)** faktor yang mempengaruhi voltan riak.

[3 marks]
[3 markah]

QUESTION 3

CLO1
C3

The values of inductors L_1 and L_2 of the resonant circuit of a Hartley Oscillator are $L_1 = 22 \mu\text{H}$ and $L_2 = 70 \mu\text{H}$ respectively. The capacitor has a value of 20pF . Calculate the operating oscillator frequency.

SOALAN 3

Diberi nilai induktan untuk dua induktor iaitu L_1 dan L_2 bagi pengayun jenis Hartley ialah $L_1 = 22 \mu\text{H}$ dan $L_2 = 70 \mu\text{H}$ masing-masing. Nilai kapasitor ialah 20pF . Kirakan nilai frekuensi pengayun tersebut.

[3 marks]
[3 markah]

QUESTION 4

CLO1
C1

List **THREE (3)** types of LC Oscillator

SOALAN 4

Senaraikan **TIGA (3)** jenis litar pengayun LC

[3 marks]
[3 markah]

CLO1
C1

QUESTION 5

List the amplifier stages in a typical op-amp.

SOALAN 5

Senaraikan peringkat penguat dalam sebuah penguat kendalian.

[3 marks]
[3 markah]

QUESTION 6

Referring to Figure B6, calculate the value of Time High (T_H) and Time Low (T_L).

CLO1
C3

SOALAN 6

Merujuk kepada Rajah B6, kirakan nilai Tempoh Tinggi (T_H) dan Tempoh Rendah (T_L).

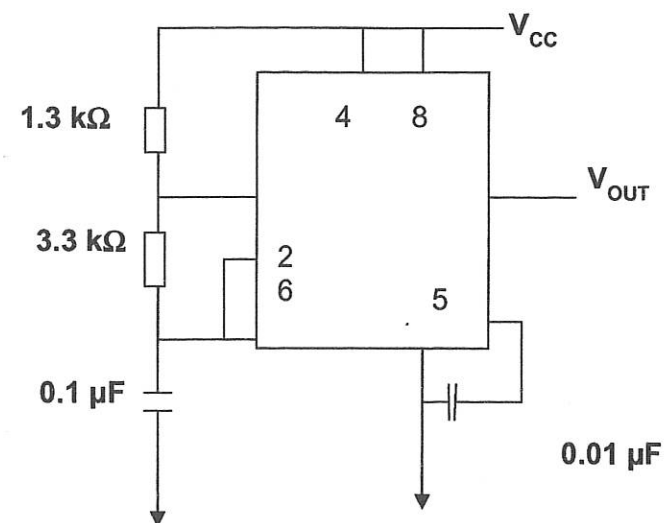


Figure B6 / Rajah B6

[3 marks]
[3 markah]

QUESTION 7

Explain briefly the Passive High Pass and Low Pass Filter.

CLO 1
C2

SOALAN 7

Terangkan dengan ringkas penapis pasif lulus tinggi dan lulus rendah.

[3 marks]
[3 markah]CLO 1
C3

QUESTION 8

Draw the schematic diagram of an active RC low pass filter with unity gain.

SOALAN 8

Lukiskan litar skematik bagi penapis aktif RC lulus rendah dengan gandaan uniti.

[3 marks]
[3 markah]

QUESTION 9

An 8-bit Digital to Analog Converter (DAC) has a full-scale output of 16.08V. Determine the step size.

SOALAN 9

8-bit (DAC) mempunyai keluaran skala penuh sebanyak 16.08V. Tentukan saiz langkah bagi DAC tersebut.

[3 marks]
[3 markah]CLO1
C2

QUESTION 10

List TWO (2) types of Digital to Analog Converter (DAC).

SOALAN 10

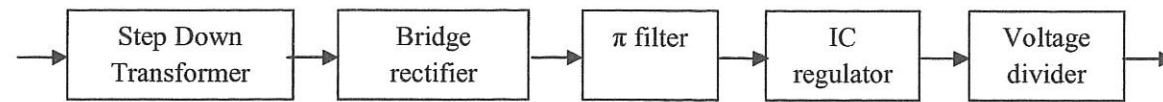
Senaraikan DUA (2) jenis penukar digital kepada analog (DAC).

[3 marks]
[3 markah]

SECTION C: 50 MARKS
BAHAGIAN C : 50 MARKAH

QUESTION 1

SOALAN 1

CLO1
C3

240 V 50Hz

Figure C1/Rajah C1

- (a) Figure C1 shows the block diagram of a linear Direct Current (DC) power supply. Draw a complete schematic circuit of the Direct Current (DC) linear power supply and calculate the output voltage of the transformer if turn's ratio is 10:1.

Rajah C1 menunjukkan gambarajah blok bekalan kuasa lurus AT. Lakarkan litar skematik lengkap bagi bekalan kuasa AT tersebut dan kirakan voltan keluaran pengubah jika transformer mempunyai nisbah 10:1.

[15 marks]
[15 markah]

CLO1
C3

- (b) Draw the output waveform at each stage of the Direct Current (DC) linear power supply.

Lukiskan bentuk gelombang keluaran untuk setiap peringkat bagi bekalan kuasa lurus AT.

[10 marks]
[10 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- a) State the differences between analog signal and digital signal.

Berikan perbezaan di antara isyarat analog dengan isyarat digital.

[4 marks]
[4 markah]

CLO1
C3

- b) A 3-bit binary R/2R Ladder Digital to Analog Converter (DAC) with $R = 2\text{ k}\Omega$, $R_f = 1\text{ k}\Omega$ and $V_{ref} = -5\text{V}$. Calculate V_{out} for 001, V_{out} for 111 and V_{out} for 101.

3-bit binary R/2R ladder penukar digital kepada analog (DAC)

dengan $R = 2\text{ k}\Omega$, $R_f = 1\text{ k}\Omega$ and $V_{ref} = -5\text{V}$. Kirakan $V_{keluaran}$ untuk 001, $V_{keluaran}$ untuk 111 dan $V_{keluaran}$ untuk 101.

[6 marks]
[6 markah]

CLO1
C3

- c) Sketch a 4-bit digital ramp Analog to Digital Converter (ADC) and explain briefly the operation of the circuit.

Lakarkan sebuah 4-bit tanjakan digital Penukar Analog ke Digital (ADC) dan terangkan secara ringkas tentang operasi litar tersebut.

[8 marks]
[8 markah]

CLO1
C3

- d) A Digital to Analog Converter (DAC) is a device that converts a digital code to an analog signal. Design a converter circuit for 5-bit Binary Weighted Resistor with a reference voltage, $V_{ref} = -12V$. The input bit, ABCDE is applied to the circuit with the Most Significant Bit (MSB) input resistor is $5k\Omega$. Show all related calculation.

Penukar digital ke analog (DAC) merupakan sebuah alat yang menukarkan kod digital kepada isyarat analog. Reka sebuah litar penukar 5-bit Perintang Pemberat Binari dengan voltan rujukan, $V_{ref} = -12V$. Bit masukan, ABCDE dibekalkan kepada litar tersebut dengan perintang masukan (MSB) ialah $5k\Omega$. Tunjukkan semua pengiraan yang berkaitan.

[7 marks]

[7 markah]

SOALAN TAMAT