



KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

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

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI I : 2023/2024

DEE30043: ELECTRONIC CIRCUITS

TARIKH : 22 DISEMBER 2023
MASA : 3.00 PTG – 5.00 PTG

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.
Bahagian A: Subjektif (4 soalan)
Bahagian B: Esei (1 soalan)

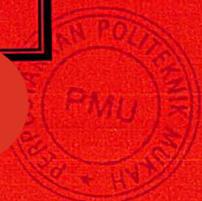
Dokumen sokongan yang disertakan : FORMULA

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

PERPUSTAKAAN
POLITEKNIK MUKAH SARAWAK

| | |
|-----------------|---------------------------|
| No. Pendaftaran | BP0000 4857 |
| No. Pengelasan | 621.3076 / 3UE SESI 23/24 |
| Tarikh | 7.5.2024 |



SECTION A: 80 MARKS
BAHAGIAN A: 80 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1
SOALAN 1

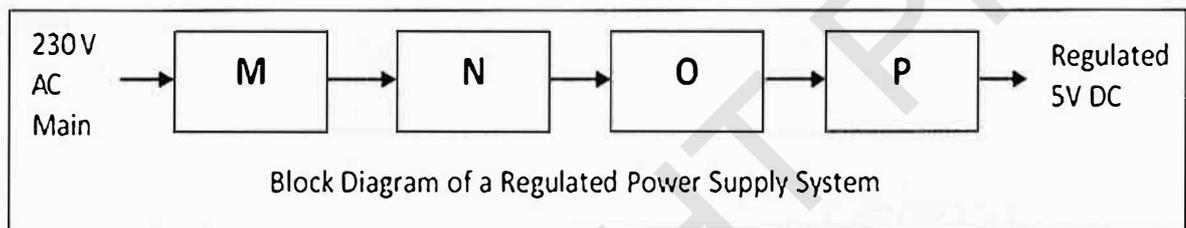


Figure A1(a)/ Rajah A1(a)

CLO1

- a) Based on Figure A1 (a), name the block for 'M', 'N', 'O', and 'P'.

Berdasarkan Rajah A1 (a), namakan blok bagi 'M', 'N', 'O', dan 'P'.

[4 marks]

[4 markah]

CLO1

- b) Explain the operation of the Hartley Oscillator.

Terangkan operasi litar pengayun Hartley.

[6 marks]

[6 markah]

CLO1

- c) Sketch a complete power supply circuit that consists of a transformer, full-wave rectifier, LC filter, Zener diode regulator, and variable resistor voltage divider. Then draw the expected input and output waveforms.

Lakarkan dengan lengkap unit bekalan kuasa yang mengandungi litar pengubah, penerus gelombang penuh, penapis LC, pengatur diod Zener dan pembahagi voltan perintang boleh ubah. Seterusnya lukiskan gelombang masukan dan keluaran yang sepatutnya.

[10 marks]

[10 markah]

QUESTION 2
SOALAN 2

CLO1

- a) State **TWO (2)** Barkhausen criteria for a circuit to be an oscillator.

Nyatakan DUA (2) kriteria Barkhausen untuk satu litar menjadi pengayun.

[4 marks]

[4 markah]

CLO1

- b) Compare **THREE (3)** differences between an Astable multivibrator and a Monostable multivibrator.

Bandingkan TIGA (3) perbezaan di antara pemperbilang getar tak stabil dan pemperbilang getar monostabil.

[6 marks]

[6 markah]

CLO1

- c) Based on Figure A2(c), calculate the time high (TH) and time low (TL), the frequency of the output, and the percentage of the duty cycle.

Berpandukan Rajah A2(c), kirakan tempoh menaik (TH) dan tempoh menurun, (TL), frekuensi keluaran dan peratus kitar kerja.

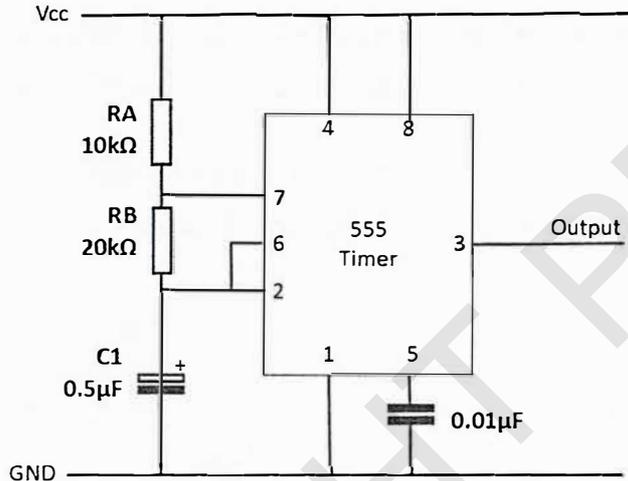


Figure A2(c)/ Rajah A2(c)

[10 marks]

[10 markah]

QUESTION 3
SOALAN 3

CLO1

- a) List **TWO (2)** types of a sinusoidal oscillator circuit with **ONE (1)** example for each type.

*Senaraikan **DUA (2)** jenis pengayun sinusoidal dengan **SATU (1)** contoh bagi setiap jenis.*

[4 marks]

[4 markah]

CLO1

- b) Explain **THREE (3)** differences between an active filter and a passive filter.

Terangkan TIGA (3) perbezaan di antara penapis aktif dan penapis pasif.

[6 marks]

[6 markah]

CLO1

- c) Based on Figure A3(c), sketch the ideal frequency response second-order high-pass active filter, and calculate the cut-off frequency and voltage gain.

Berpandukan Rajah A3(c), lakarkan sambutan frekuensi ideal penapis aktif laluan tinggi tertib kedua, dan kirakan frekuensi potong dan gandaan voltan.

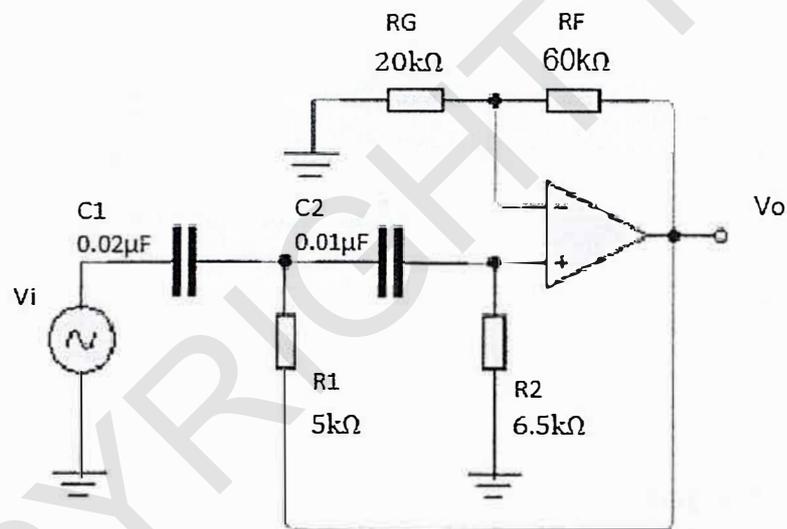


Figure A3(c)/ Rajah A3(c)

[10 marks]

[10 markah]

QUESTION 4
SOALAN 4

CLO1

- a) State the function of an Analogue to Digital Converter (ADC) and list **TWO (2)** types of ADC.

Nyatakan fungsi litar bagi Penukar Analog ke Digital (ADC) dan senaraikan DUA (2) aplikasi ADC.

[4 marks]

[4 markah]

CLO1

- b) Explain the differences between an R/2R Ladder Circuit and a Binary Weighted Resistor.

Terangkan perbezaan di antara Litar R/2R dan Perintang Pemberat Binari.

[6 marks]

[6 markah]

CLO1

- c) Digital to Analog converter 5-bit with step size of 10mV. Calculate for full scale voltage and a percent resolution. Draw a 3-bits system of R-2R Ladder Circuit to perform Digital to Analogue conversion.

Kirakan voltan skala penuh dan peratus resolusi bagi Penukar Digital kepada Analog 5-bit dengan saiz langkah 10mV. Lukiskan gambarajah litar Penukar Digital kepada Analog 3-bit R-2R untuk melakukan penukaran Digital kepada Analog.

[10 marks]

[10 markah]

SECTION B: 20 MARKS
BAHAGIAN B: 20 MARKAH

INSTRUCTION:

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

ARAHAN:

Bahagian ini mengandungi SATU (1) soalan esei. Jawab soalan berikut.

CLO1

QUESTION 1

SOALAN 1

An Inverting summing is an op-amp circuit that combines several inputs and produces an output that is the weighted sum of the inputs. Carry out the output voltage equation (V_o) by drawing the inverting summing amplifier which has three (3) inputs. Hence, calculate the current inputs I_1 , I_2 , I_3 , and output voltage if $R_F=10k\Omega$, $R_1=5k\Omega$, $R_2=2.5k\Omega$, $R_3=8k\Omega$ and input voltages $V_1=2V$, $V_2=4V$, $V_3=6V$. Draw the waveforms of the input and output simultaneously.

Penguat Pencampur Alikan ialah litar op-amp yang menggabungkan beberapa masukan dan menghasilkan keluaran yang merupakan jumlah wajaran masukan. Keluarkan persamaan voltan keluaran (V_o) dengan melukis Penguat Pencampur Alikan yang mempunyai tiga (3) masukan. Oleh itu, kirakan arus masukan I_1 , I_2 , I_3 dan voltan keluaran jika $R_F=10k\Omega$, $R_1=5k\Omega$, $R_2=2.5k\Omega$, $R_3=8k\Omega$ dan voltan masukan $V_1=2V$, $V_2=4V$, $V_3=6V$. Lukiskan bentuk gelombang masukan dan keluaran secara serentak.

[20 marks]

[20 markah]

SOALAN TAMAT

| BIL | LIST OF FORMULA |
|-----|---|
| 1. | $f = \frac{1}{2\pi RC\sqrt{2N}}$ |
| 2. | $f = \frac{1}{2\pi\sqrt{LC}}$ |
| 3. | $CMRR = \frac{A_D}{A_C}$ |
| 4. | $CMRR_{dB} = 20 \log_{10} \frac{A_D}{A_C}$ |
| 5. | $A_V = \frac{V_O}{V_i}$ |
| 6. | $A_V = -\frac{R_f}{R_{in}}$ |
| 7. | $A_V = 1 + \frac{R_f}{R_{in}}$ |
| 8. | $V_O = -\left\{\left(\frac{R_f}{R_{in}}\right)(V_{in1} + V_{in2} + V_{in3} + \dots + V_{inN})\right.$ |
| 9. | $V_O = \frac{R_2}{R_1} (V_2 - V_1)$ |

| | |
|-----|--|
| 10. | $V_o = -R_f C \frac{dV_{in}}{dt}$ |
| 11. | $V_o = -\frac{1}{R_{in} C} \int V_{in} dt$ |
| 12. | $T = 1.1 RC$ |
| 13. | $T_H = 0.693(R_A + R_B)C$ |
| 14. | $T_L = 0.693(R_B)C$ |
| 15. | $T = T_H + T_L$ |
| 16. | $f = \frac{1}{T_H + T_L}$ $f = \frac{1.44}{(R_A + R_B)C}$ |
| 17. | $\%Duty\ Cycle = \frac{T_H}{T_H + T_L} \times 100$ $\%Duty\ Cycle = \frac{R_A + R_B}{R_A + 2R_B} \times 100$ |
| 18. | $X_c = R = \frac{1}{2\pi f_c C}$ $f_c = \frac{1}{2\pi RC}$ $A_{V\ dB} = 20 \text{ Log } \frac{V_o}{V_i}$ |
| 19. | $V_o = -(V_D + \frac{1}{2}V_C + \frac{1}{4}V_B + \frac{1}{8}V_1)$ |
| 20. | $V_o = -\frac{V_{ref}}{2^n - 1} \times B_{in} \times \frac{R_f}{R}$ |
| 21. | $\text{Step size} = 2^n - 1$ |
| 22. | $\text{Percentage of Resolution}(\%) = \frac{V_{ofs}}{2^n - 1} \times 100$ |
| 23. | $T_c = \text{Step size} \times T$ |