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 I : 2025/2026

DEE30163: ELECTRONIC CIRCUITS

TARIKH : 06 DISEMBER 2025
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas soalan 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)

SECTION A: 80 MARKS

BAHAGIAN A: 80 MARKAH

INSTRUCTIONS:

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) List **FOUR (4)** types of sinusoidal oscillator circuits.

*Senaraikan **EMPAT (4)** jenis litar pengayun sinusoidal.*

[4 marks]

[*4 markah*]

CLO1 (b) Explain the operation of a bridge rectifier during the positive and negative half-cycles of AC voltage with the aid of a simple diagram showing the current flow through the diodes.

Terangkan operasi jambatan penerus (bridge rectifier) semasa separuh kitaran positif dan separuh kitaran negatif voltan AC dengan bantuan gambarajah yang menunjukkan aliran arus melalui diod.

[6 marks]

[6 *markah*]

CLO1 (c)

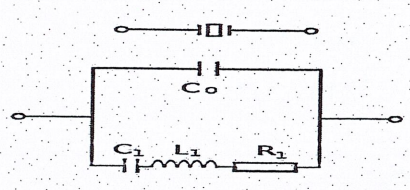

Figure A1 (c) / *Rajah A1 (c)*

Figure A1 (c) shows the crystal equivalent circuit. If the values of L = 4H, C1 = 530pF, R = 5kΩ and C_O = 0.85 nF. Calculate the series and parallel resonant frequency of the crystal.

Rajah A1 (c) menunjukkan litar persamaan kristal. Jika nilai L = 4H, C1 = 530pF, R = 5kΩ and C_O = 0.85 nF. Kirakan frekuensi ayunan sesiri dan selari untuk kristal tersebut.

[10 marks]

[*10 markah*]

QUESTION 2

SOALAN

CLO1 (a) Name the block diagram of a DC Power Supply in Figure A2 (1).

Namakan blok rajah bagi Bekalan Kuasa DC dalam Rajah A2 (1).

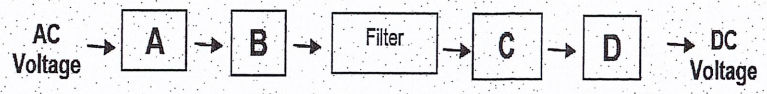

Figure A2(1) / *Rajah A2 (1)*

[4 marks]

[*4 markah*]

CLO1 (b) The block diagram of an operational amplifier consists of three main blocks which are the Differential Amplifier, Gain Amplifier Stage, and Push-Pull Output Stage. Explain the function of each block briefly.

Rajah blok bagi penguat operasi (operational amplifier) terdiri daripada tiga blok utama iaitu Differential Amplifier, Gain Amplifier Stage, dan Push-Pull Output Stage. Terangkan secara ringkas fungsi setiap blok tersebut.

[6 marks]

[*6 markah*]

CLO1 (c) Express the output voltage equation (V_o) with a drawing of the circuit of Non-Inverting Amplifier. Hence calculate the output voltage if $R_F = 10k\Omega$, $R_{IN} = 5k\Omega$ and input voltage = $1mV_{p-p}$.

Tunjukkan persamaan voltan keluaran dengan melukis litar Penguat Bukan Alikan. Seterusnya kirakan voltan keluaran jika $R_F = 10k\Omega$, $R_{IN} = 5k\Omega$ dan voltan masukan = $1mV_{p-p}$.

[10 marks]

[*10 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) State **FOUR (4)** characteristics of an Ideal Operational Amplifier.

*Nyatakan **EMPAT (4)** ciri-ciri Penguat Operasi Ideal*

[4 marks]

[*4 markah*]

CLO1 (b) Timer 555 is an extremely stable integrated circuit that can operate as an Astable Multivibrator and Monostable Multivibrator. With the aid of a diagram, compare Astable and Monostable Multivibrators.

Timer 555 ialah litar bersepadu yang sangat stabil dan boleh beroperasi sebagai Astable multivibrator dan Monostable Multivibrator. Dengan bantuan rajah, bandingkan antara Astable dan Monostable Multivibrator.

[6 marks]

[*6 markah*]

CLO1 (c) A 555 timer is connected as an Astable Multivibrator. A 0.01uF which is used as a noise divertor is connected to pin 5 and is grounded. If a frequency and duty cycle of 30 kHz and 75% respectively are required at the output. Calculate the values of resistors when a 0.1uF capacitor is used.

Pemasa 555 disambungkan sebagai Multivibrator Astabil. 0.01uF yang digunakan sebagai penapis bunyi disambungkan ke pin 5 dan dibumikan. Jika frekuensi dan kitaran tugas 30 kHz dan 75% masing-masing diperlukan pada output. Kira nilai perintang- perintang apabila pemuat 0.1uF digunakan.

[10 marks]

[*10 markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Describe **FOUR (4)** applications of filter circuits.

*Terangkan **EMPAT (4)** kegunaan litar penapis.*

[4 marks]

[*4 markah*]

CLO1 (b) Explain **THREE (3)** differences between Passive Filter and Active Filter.

*Terangkan **TIGA (3)** perbezaan di antara Penapis Pasif dengan Penapis Aktif.*

[6 marks]

[*6 markah*]

CLO1 (c) With the aid of RC high pass filter diagram, calculate the cut off frequency of the filter if the value of R= 250Ω and C = 50nF.

Lukiskan gambar rajah RC high pass filter. *Kemudian, kirakan* cut off frequency *bagi penapis jika nilai R= 250Ω dan C = 50nF.*

[10 marks]

[*10 markah*]

SECTION B: 20 MARKS

BAHAGIAN B: 20 MARKAH

INSTRUCTIONS:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1

In the real world, digital audio systems such as music players, smartphones, and computer sound cards use a Digital-to-Analog Converter (DAC) to transform digital data into analog signals that can be sent to speakers. One common method in electronic circuit design is the R2R ladder DAC, which is widely used because it requires only two resistor values and is easy to implement. With the aid of a 4-bit R-2R ladder circuit diagram with given values of Rf = R = 20 kΩ, step size = 15mV and Vref = 5V, calculate the full-scale voltage, percentage resolution and analogue output voltage corresponding to digital input code 1011_2.

Di dalam dunia sebenar, sistem audio digital seperti pemain muzik, telefon pintar, dan kad bunyi komputer menggunakan Penukar Digital-ke-Analog (DAC) untuk menukarkan data digital kepada isyarat analog yang boleh dihantar ke pembesar suara. Salah satu kaedah biasa dalam reka bentuk litar elektronik ialah DAC rantaian tangga R-2R, yang banyak digunakan kerana hanya memerlukan dua nilai perintang dan mudah dilaksanakan. Dengan bantuan rajah litar R-2R 4-bit dengan nilai yang diberi Rf = R = 20 kΩ, saiz langkah (step size) = 15 mV dan Vref = 5 V, hitungkan voltan skala penuh (full-scale), peratus resolusi dan voltan keluaran analog yang bersesuaian dengan kod input digital 1011_2.

[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.	$A_V = 1 + \frac{R_f}{R_g}$
8.	$V_o = -[\frac{R_f}{R_1}(V_1) + \frac{R_f}{R_2}(V_2) + \cdots \frac{R_f}{R_n}(V_n)]$
9.	$V_o = \frac{R_2}{R_1}(V_2 - V_1)$
10.	$Vo = -R_f C\frac{dV_{in}}{dt}$
11.	$Vo = -\frac{1}{R_{in}C}\int V_{in}\ dt$
12.	T = 1.1 RC
13.	$T_H = 0.693(R_A + R_B)C$
14.	$T_L = 0.693(R_B)C$
15.	$T = T_H + T_L$ $T = 0.693\ (R_A + 2R_B)C$

BIL	LIST OF FORMULA
16.	$f = \frac{1}{T_H + T_L}$ $f = \frac{1.44}{(R_A + 2R_B)C}$
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.	$X_C = R = \frac{1}{2\pi f_c C}$ $f_c = \frac{1}{2\pi RC}$ $A_{V\ dB} = 20\ Log \frac{V_o}{V_i}$
19.	$V_o = -\left[\frac{R_F}{R}(V_1) + \frac{R_F}{2R}(V_2) + \frac{R_F}{4R}(V_3) + \cdots \frac{R_F}{2^{(N-1)R}}(V_N)\right]$
20.	$V_o = -\frac{V_{ref}}{2^n} \times B_{in} \times \frac{R_f}{R}$
21.	$Total\ steps = 2^n - 1$
22.	$\%\ resolution = \frac{Step\ size}{Full\ scale} \times 100\%$ $\%\ Resolution = \frac{1}{2^n - 1}\ x\ 100\%$
23.	$T_C = Step\ size \times T$ $Conversion\ time = Number\ of\ steps \times T$