CLO2
C3

10. This configuration of op-amps and resistors can produce an analog output voltage equal to the binary input, ABCD. The voltage levels for logic '0' is represented by 0V and logic '1' is represented by -5V. Calculate the output voltage for an input of 0111.

*Konfigurasi litar penguat kendalian dan perintang ini akan menghasilkan voltan keluaran analog yang bersamaan dengan masukan binari, ABCD. Aras voltan untuk logik '0' ialah 0V dan logik '1' ialah -5V. Kirakan voltan keluaran untuk masukan 0111.*
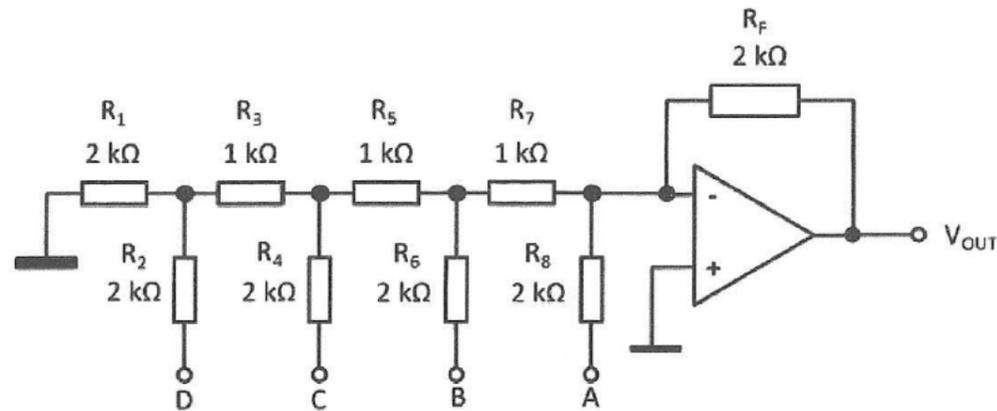


A. 1.094V

B. 2.188V

C. 4.375V

D. 8.750V

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

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

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

**QUESTION 1**

*SOALAN 1*

CLO1
C1

(a) State **THREE (3)** types of rectifier.

*Nyatakan TIGA (3) jenis penerus.*

[3 marks]

*[3 markah]*

CLO1
C2

(b) Explain the operation of a serial transistor voltage regulator circuit with the aid of a diagram.

*Terangkan operasi litar pengatur voltan transistor sesiri dengan bantuan gambarajah.*

[5 marks]

*[5 markah]*

CLO2
C3

(c) Referring to Figure B1(c), calculate the ripple voltage of the waveform. Then, sketch a diagram of π LC filter circuit and explain briefly the operations of the circuit.

*Merujuk kepada Rajah B1(c), kirakan voltan riak bagi gelombang tersebut. Kemudian, lakarkan rajah bagi penapis π LC dan terangkan operasi litar berkenaan.*
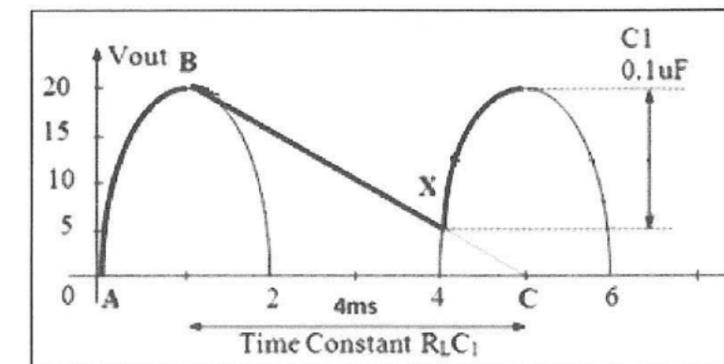


Figure B1(c) / *Rajah B1(c)*

[7 marks]
*[7 markah]*

## QUESTION 2
*SOALAN 2*

CLO1
C1

(a) Write **THREE (3)** differences between LC oscillator and RC oscillator.

*Tuliskan **TIGA (3)** perbezaan antara Pengayun LC dan Pengayun RC.*

[3 marks]

*[3 markah]*

CLO2
C3

(b) Given the value of components at frequency generated circuit, L = 2mH and C1 = C2=0.01µF, calculate the oscillation frequency, $f_o$ for the Colpitts Oscillator.

*Diberi nilai komponen pada litar penjanaan frekuensi, L = 2mH dan C1= C2 = 0.01µF, kirakan frekuensi ayunan, $f_o$ bagi Pengayun Colpitts.*

[6 marks]

*[6 markah]*

CLO2
C3

(c) Sketch the electrical equivalent circuit of a Crystal Oscillator. If, $R_h$ = 600Ω, $L_h$ = 0.08 H, $C_h$ = 0.003 pF and $C_m$ = 8 pF. Calculate the serial resonance frequency for the oscillator.

*Lakarkan litar setara elektrik bagi Pengayun Hablur. Jika, $R_h$ = 600Ω, $L_h$ = 0.08 H, $C_h$ = 0.003 pF dan $C_m$ = 8 pF. Kirakan frekuensi resonan sesiri untuk pengayun ini.*

[6 marks]

*[6 markah]*

## QUESTION 3
*SOALAN 3*

CLO1
C2

(a) With the aid of the suitable circuits, compare the passive low pass filter and active low pass filter.

*Dengan bantuan litar yang sesuai, bandingkan penapis jenis lulus rendah pasif dan penapis lulus rendah aktif.*

[3 marks]

*[3 markah]*

CLO2
C3

(b) Calculate the cut off frequency, $f_c$ and sketch the frequency response curve for a high pass filter that consists of 82pF capacitor connected in series with 240KΩ resistor.

*Kirakan frekuensi potong, $f_c$ dan lakarkan lengkung sambutan frekuensi bagi penapis lulus tinggi yang terdiri daripada kapasitor 82pF yang disambungkan sesiri dengan perintang 240KΩ.*

[6 marks]

*[6 markah]*

CLO2
C3

(c) Calculate and show the bandwidth if the circuit of High Pass Filter consist of C = 15nF and R = 10KΩ and the circuit of Low Pass Filter consist of C = 500pF and R = 10KΩ.

*Kira dan tunjukkan lebar jalur sekiranya litar penapis lulus tinggi terdiri daripada C = 15nF and R = 10KΩ and the circuit of Low Pass Filter consist of C = 500pF and R = 10KΩ*

[6 marks]

*[6 markah]*

## QUESTION 4
### SOALAN 4

CLO1
C1

(a) List **THREE (3)** main parts of Digital Ramp Converter.

*Senaraikan TIGA (3) bahagian utama Penukar Tanjakan Digital.*

[3 marks]

*[3 markah]*

CLO1
C2

(b) With the aid of circuit diagrams, compare between 2 bits Binary Weighted Resistor circuit and 2 bits R-2R Ladder circuit for Digital-to-Analog Converter (DAC).

*Dengan bantuan rajah litar, bandingkan litar Perintang Pemberat Perduaan 2 bit dan litar R-2R Ladder 2 bit Penukar Digital-ke-Analog (DAC).*

[5 marks]

*[5 markah]*

CLO2
C3

(c) Referring to Figure B4(c), calculate the digital value of $V_{in} = 2.3V$ if the step size is 1.5V.

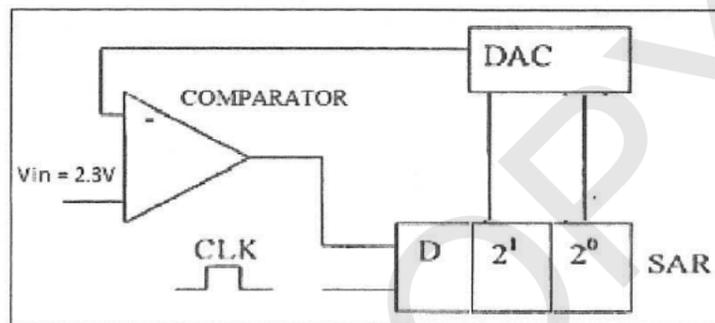*Merujuk Rajah B4(c), kirakan nilai digital bagi $V_{in} = 2.3V$ sekiranya saiz langkahnya ialah 1.5V.*



Figure B4(c) / *Rajah B4(c)*

[7 marks]
*[7 markah]*

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**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

Compare the **THREE(3)** ideal to the practical characteristics of operational amplifier. Describe the Common Mode Rejection Ratio (CMRR) and calculate CMRR when feedback resistor (Rf) = 100kΩ, Resistor R1 = 10 kΩ and Common mode gain = 0.001.

*Bandingkan TIGA(3) ciri-ciri unggul dan praktikal penguat kendalian. Huraikan Nisbah Tolakan Mod Sepunya (CMRR) dan kirakan CMRR apabila perintang suapbalik = 100kΩ, perintang tetap R1 = 10 kΩ and gandaan mod sepunya = 0.001.*

[15marks]
*[15 markah]*

## QUESTION 2
### SOALAN 2

CLO2
C3

Draw a 555 Astable Multivibrator completely with a frequency of 1 KHz and a mark to space ratio of 2:1. A 10nF capacitor is used in the circuit. Show all the calculations to construct the multivibrator.

*Lukiskan litar lengkap pembilang getar astabil 555 dengan frekuensi 1 KHz dan nisbah ruang 2:1. Kapasitor 10nF digunakan. Tunjukkan semua pengiraan untuk membina pembilan getar.*

[15 marks]
*[15 markah]*

**SOALAN TAMAT**