



**KOLEJ YAYASAN PELAJARAN JOHOR
ONLINE FINAL EXAMINATION**

COURSE NAME : **DIGITAL ELECTRONICS**
COURSE CODE : **DKE 1083**
EXAMINATION : **JUNE 2022**
DURATION : **2 HOURS 30 MINUTES**

**INSTRUCTION TO CANDIDATES /
ARAHAN KEPADA CALON**

1. This examination paper consists of **ONE (1)** part: PART A (100 marks) /
*Kertas soalan ini mengandungi **SATU (1)** bahagian:* BAHAGIAN A (100 markah)
2. Answer ALL questions in the answer sheet which is A4 size paper (or other paper with the consent of the relevant lecturer). /
Jawab SEMUA soalan di dalam kertas jawapan iaitu kertas bersaiz A4 (atau lain-lain kertas dengan persetujuan pensyarah berkaitan).
3. Write your details as follows in the upper left corner for each answer sheet: /
Tulis butiran anda sepertimana berikut di penjuru atas kiri bagi setiap kertas jawapan:
 - i. Student Full Name / *Nama Penuh Pelajar*
 - ii. Identification Card (I/C) No. / *No. Kad Pengenalan*
 - iii. Class Section / *Seksyen Kelas*
 - iv. Course Code / *Kod Kursus*
 - v. Course Name / *Nama Kursus*
 - vi. Lecturer Name / *Nama Pensyarah*
4. Each answer sheet must have a page number written at the bottom right corner. /
Setiap helai kertas jawapan mesti ditulis nombor muka surat di penjuru bawah kanan.
5. Answers should be **neat and clear in handwritten form**. /
Jawapan hendaklah ditulis tangan, kemas dan jelas.

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO /
JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU**

This examination paper consists of 12 printed pages including front page
Kertas soalan ini mengandungi 12 muka surat termasuk kulit hadapan

This part contains of **FIVE (5)** questions. Answer **ALL** questions in the answer sheet.

*Bahagian ini mempunyai **LIMA (5)** soalan. Jawab **SEMUA** soalan di dalam kertas jawapan.*

QUESTION 1/ SOALAN 1

a) Explain briefly **two (2)** advantages of digital system.

(4 marks/ markah)

b) List the hexadecimal numbers in sequence from AD_{16} , BA_{16} to 115_{16} .

(6 marks/ markah)

c) Without using scientific calculator, identify all the numbers given below to the numbering system required.

i. 286_{10} = _____₁₆

ii. $F1F4_{16}$ = _____₈

iii. 110010.111_2 = _____₁₀

iv. 22_{10} = ______{Gray}

v. 622_8 = ______{BCD}

(10 marks/ markah)

- a) Terangkan secara ringkas **dua (2)** kebaikan sistem digital.
- b) Senaraikan nombor-nombor hexadecimal dalam turutan dari AD_{16} , BA_{16} ke 115_{16} .
- c) Tanpa menggunakan mesin kira saintifik, kenal pasti nombor-nombor yang diberi di bawah kepada sistem penomboran yang dikehendaki.

- i. 286_{10} = _____₁₆
- ii. $F1F4_{16}$ = _____₈
- iii. 110010.111_2 = _____₁₀
- iv. 22_{10} = ______{Gray}
- v. 622_8 = ______{BCD}

QUESTION 2/ SOALAN 2

- a) Express the following expressions to the simplest logic equation using deMorgan Theorem and Boolean Algebra.

- i. $Y = X\bar{Z}(W + \bar{Z}) + WX$
- ii. $V = ABC + A\bar{B}C + B\bar{C}(\bar{C}D + CD)$
- iii. $W = \overline{AB(A+B)}$

(9 marks/ markah)

- b) **Figure Q2(b)** shows a diagram for an automobile alarm circuit used to detect certain undesirable conditions. The three switches S2, S1 and S0 are used to indicate the status of the alarm by the door, the ignition and the headlights respectively. Produce the logic circuit using Karnough Map to alarm will be activated whenever either of the following conditions exists:

- The headlights are ON while the ignition is OFF.
- The door is open (OFF) while the ignition is ON.

(11 marks/ markah)

a) Nyatakan persamaan-persamaan berikut kepada persamaan logik teringkas menggunakan Teorem deMorgan dan Aljabar Boolean.

i. $Y = X\bar{Z}(W + \bar{Z}) + WX$

ii. $V = ABC + A\bar{B}C + B\bar{C}(\bar{C}D + CD)$

iii. $W = \overline{\overline{AB}(A+B)}$

b) **Rajah Q2(b)** menunjukkan gambar rajah bagi litar penggera automobil yang digunakan untuk mengesan keadaan tertentu yang tidak diinginkan. Tiga suis S2, S1 dan S0 digunakan untuk menunjukkan status penggera oleh pintu, pencucuh dan lampu hadapan. Hasilkan litar logik menggunakan kaedah Peta Karnough supaya penggera diaktifkan apabila salah satu daripada keadaan berikut wujud:

- Lampu hadapan adalah HIDUP semasa pencucuh diMATIKAN.
- Pintu terbuka (MATI) semasa pencucuh diHIDUPkan.

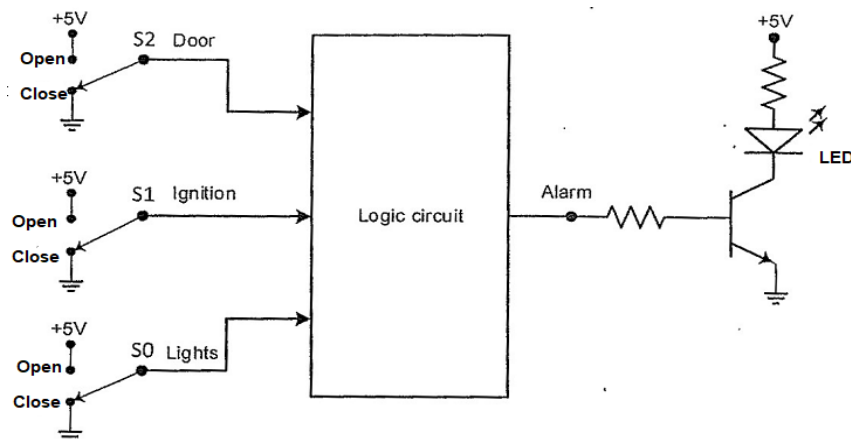


Figure Q2(b)/ Rajah Q2(b)

QUESTION 3/ SOALAN 3

- a) Complete the digit display on 7 segments in **Figure Q3(a)(ii)** in the **ATTACHMENT** by referring to the input waveform in digital circuit and IC 7448 datasheet in **Figure Q3(a)(i)**. State which one is MSB and LSB.

(10 marks/ markah)

- b) Solve each number using appropriate technique. Use 8 bits sign-magnitude, 1'st complement and 2'nd complement for the sign numbers:

- i. $-28_{10} + 22_{10}$.
- ii. $+73_{10} - 29_{10}$.
- iii. $686_{10} + 28_{10}$ (BCD addition).

(10 marks/ markah)

- a) Lengkapkan paparan digit 7 ruas dalam **Rajah Q3(a)(ii)** di dalam **LAMPIRAN** dengan merujuk pada gelombang masukan litar digital dan "datasheet" IC 7448 dalam **Rajah Q3(a)(i)**. Nyatakan yang mana adalah MSB dan LSB.

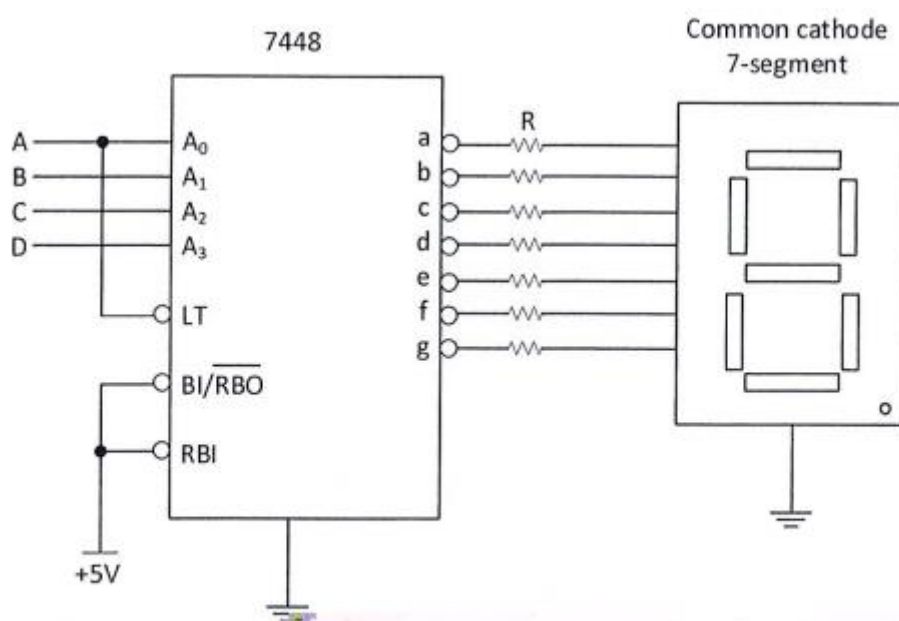


Figure Q3(a)/ Rajah Q3(a)

b) Selesaikan bagi setiap nombor dengan menggunakan kaedah yang sesuai. Gunakan 8 bit tanda magnitud bagi pelengkap 1 dan pelengkap 2 bagi nombor bertanda:

- i. $-28_{10} + 22_{10}$.
- ii. $+73_{10} - 29_{10}$.
- iii. $686_{10} + 28_{10}$ (penambahan BCD).

QUESTION 4/ SOALAN 4

a) Sketch the timing diagram in **Figure 4(a)(i)** in the **ATTACHMENT** by referring to **Figure Q4 (a)**. Assume the flip-flops are initially **LOW**.

(10 marks/ markah)

b) **Figure Q4(b)** shows an asynchronous counter circuit. Sketch the output waveform for Q_A and Q_B at **Figure Q4(b)(i)** in the **ATTACHMENT**. Assume the initial condition is **LOW**.

(10 marks/ markah)

- a) Lakarkan gambar rajah pemasaan di dalam **Rajah Q4(a)(i)** dalam **LAMPIRAN** dengan merujuk kepada **Rajah Q4(a)**. Anggap keadaan awal bagi flip-flop adalah **RENDAH**.

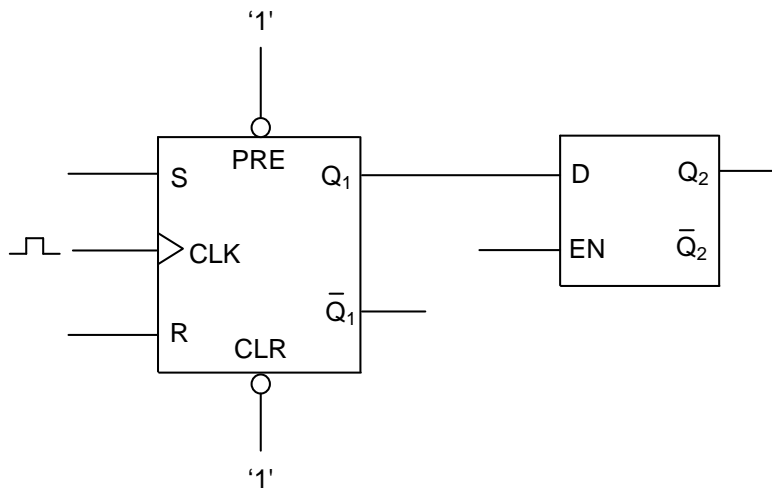


Figure Q4(a)/ **Rajah Q4(a)**

- b) **Rajah Q4(b)** menunjukkan litar pembilang tidak bergerak. Lakarkan gelombang keluaran bagi Q_A dan Q_B di **Rajah Q4(b)(i)** dalam **LAMPIRAN**. Anggap keluaran awal adalah **RENDAH**.

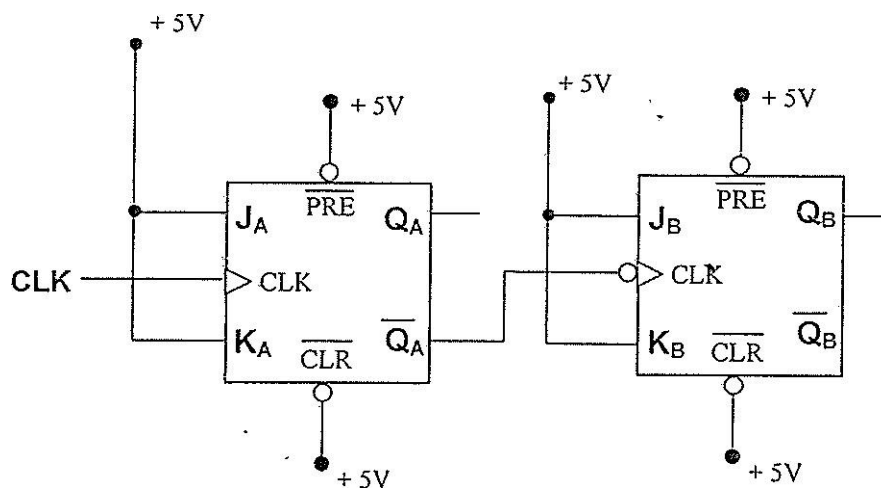


Figure Q4(b)/ **Rajah Q4(b)**

QUESTION 5/ SOALAN 5

- a) A data sheet for a TTL IC chip containing four NOR gates lists value of $I_{CCH} = 6\text{mA}$, $I_{CCL} = 16\text{mA}$ and $V_{CC} = 5\text{V}$. Calculate the average power dissipated by each gate. Show your work.

(6 marks/ markah)

- b) Referring to **Figure Q5(b)**, determine the values of:

- i. V_{IH} .
- ii. $V_{IH}(\text{min})$ and $V_{IL}(\text{max})$.
- iii. V_{OL} .
- iv. $V_{OH}(\text{min})$ and $V_{OL}(\text{max})$.

(6 marks/ markah)

- c) Explain the following term in TTL characteristics.

- i. Noise immunity.
- ii. Fan-In.
- iii. Voltage transfer curve.
- iv. Low level voltage input.

(8 marks/ markah)

a) Satu helaian data bagi cip IC TTL yang mengandungi empat get NOR mempunyai senarai nilai-nilai $I_{CCH} = 6mA$, $I_{CCL} = 16mA$ dan $V_{CC} = 5V$. Kirakan purata kelesapan kuasa bagi setiap get. Tunjukkan jalan kerja anda.

b) Merujuk kepada **Rajah Q5(b)**, tentukan nilai-nilai berikut:

- i. V_{IH} .
- ii. $V_{IH(min)}$ dan $V_{IL(max)}$.
- iii. V_{OL} .
- iv. $V_{OH(min)}$ dan $V_{OL(max)}$.

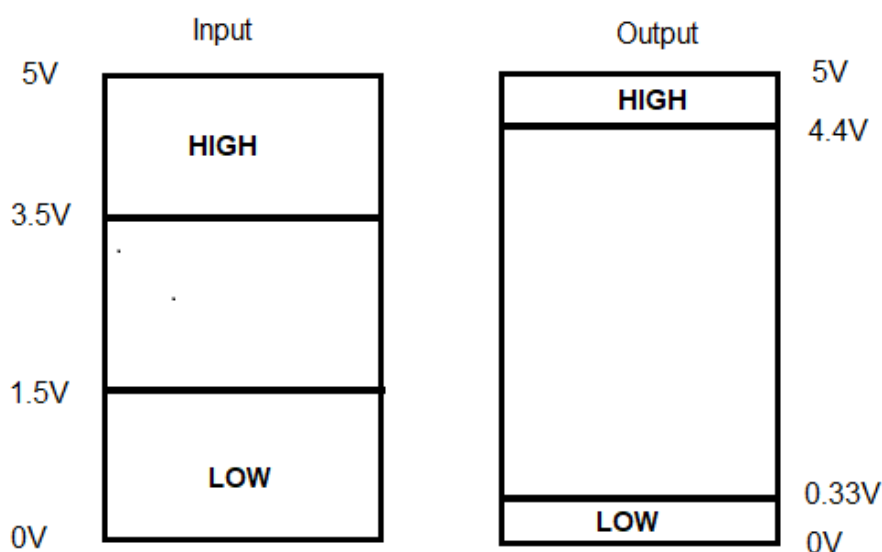


Figure Q5(b)/ Rajah Q5(b)

c) Terangkan istilah berikut mengikut ciri-ciri bagi TTL.

- i. *Imuniti hingar.*
- ii. *Rebak masuk.*
- iii. *Lengkuk pemindahan voltan.*
- iv. *Voltan masukan paras rendah.*

ATTACHMENT / LAMPIRAN

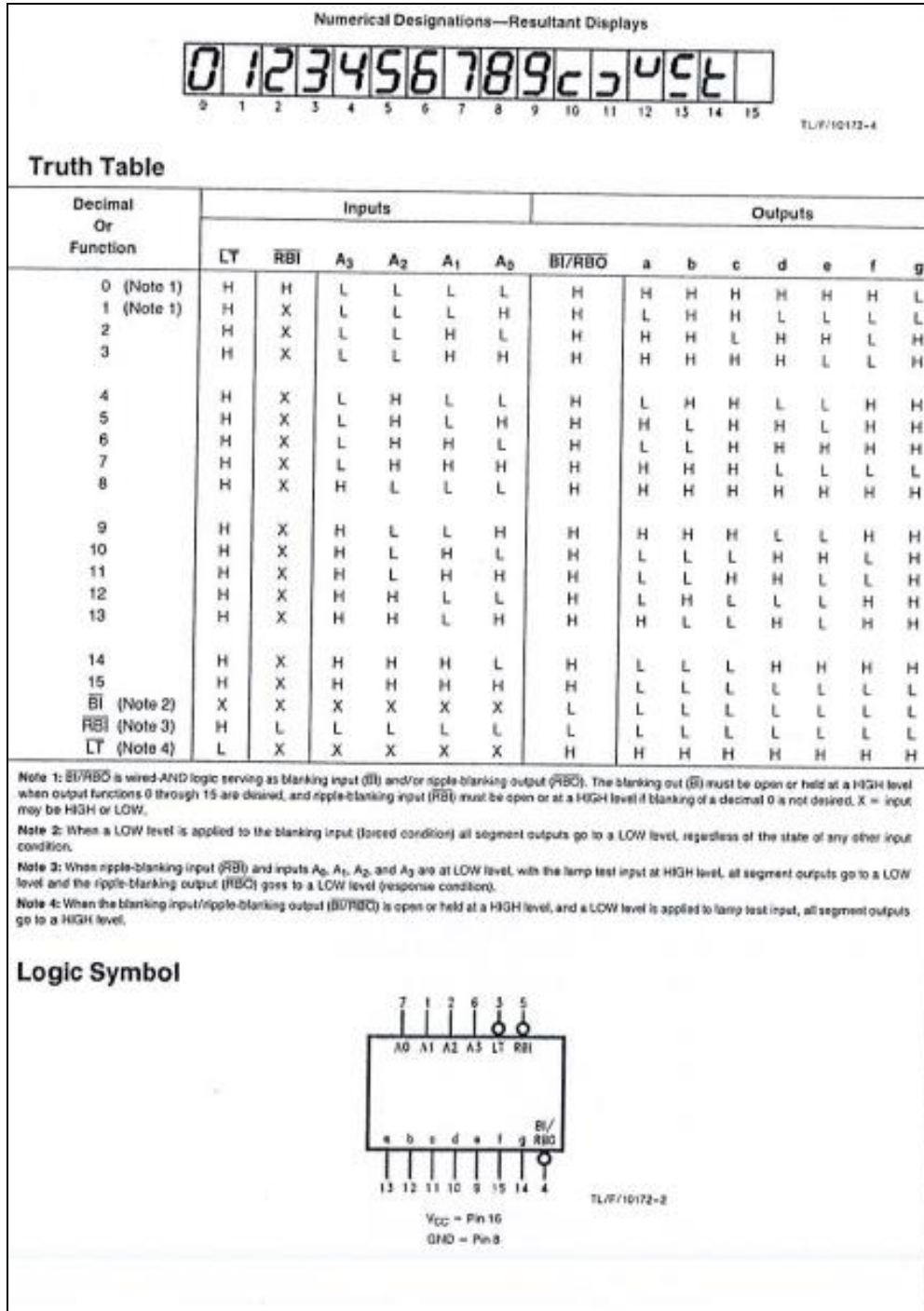


Figure Q3(a)(i)/ Rajah Q3(a)(i)

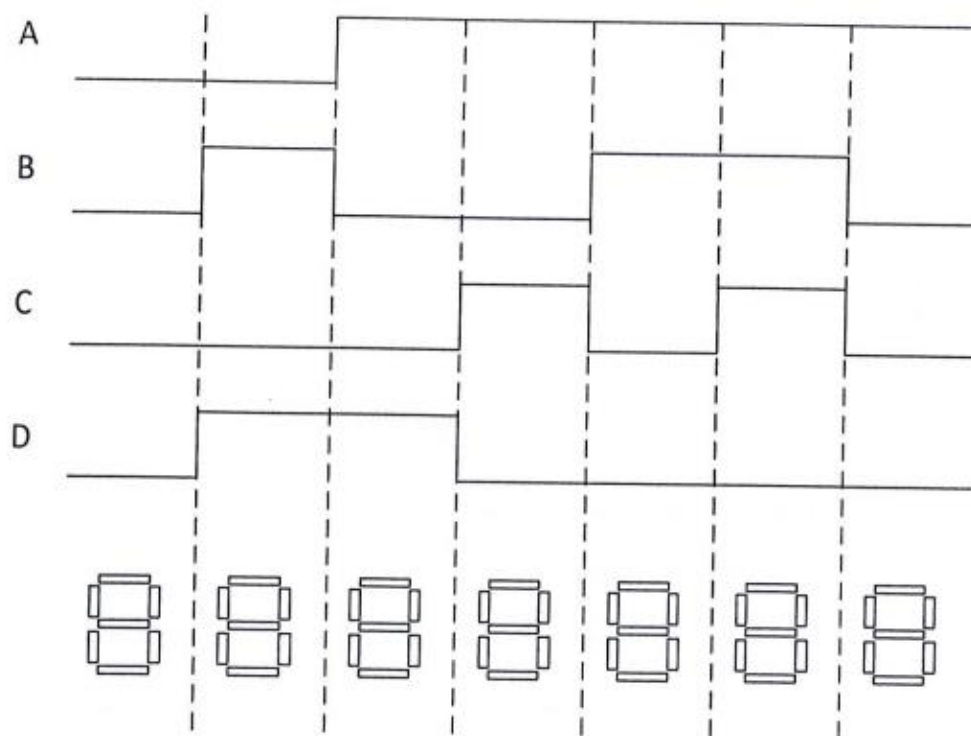


Figure Q3(a)(ii)/ *Rajah Q3(a)(ii)*

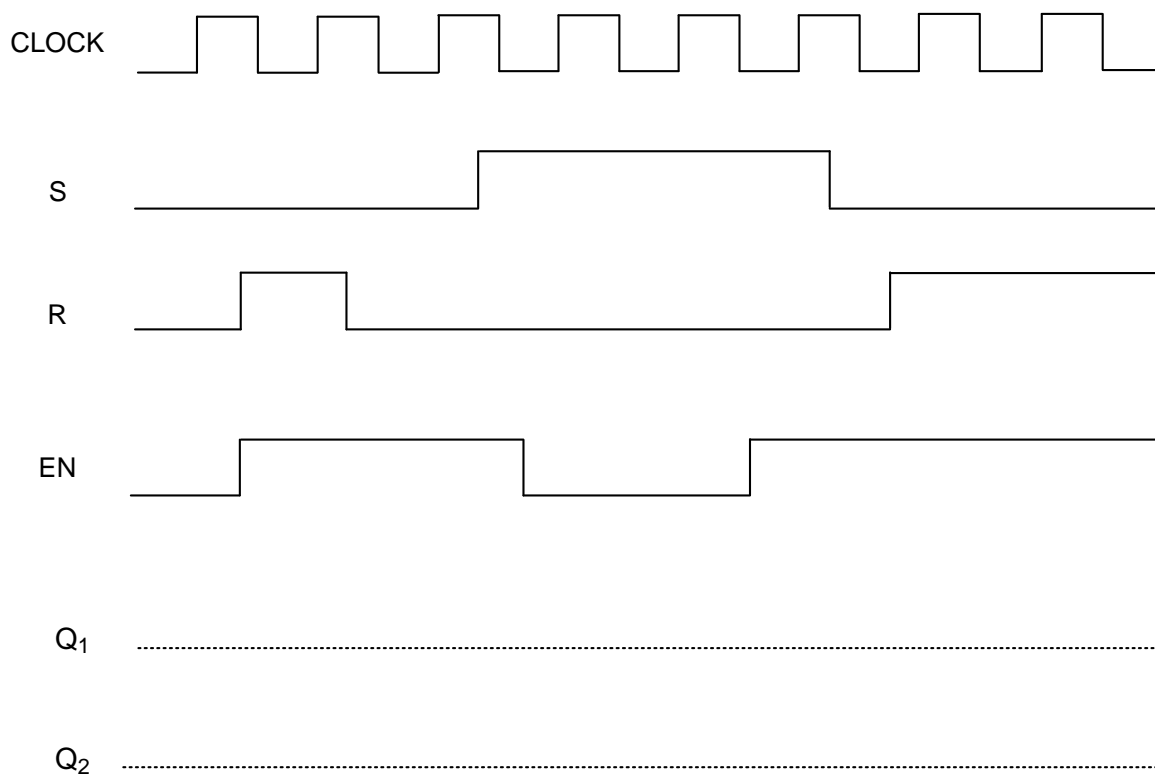


Figure Q4(a)(i)/ *Rajah Q4(a)(i)*

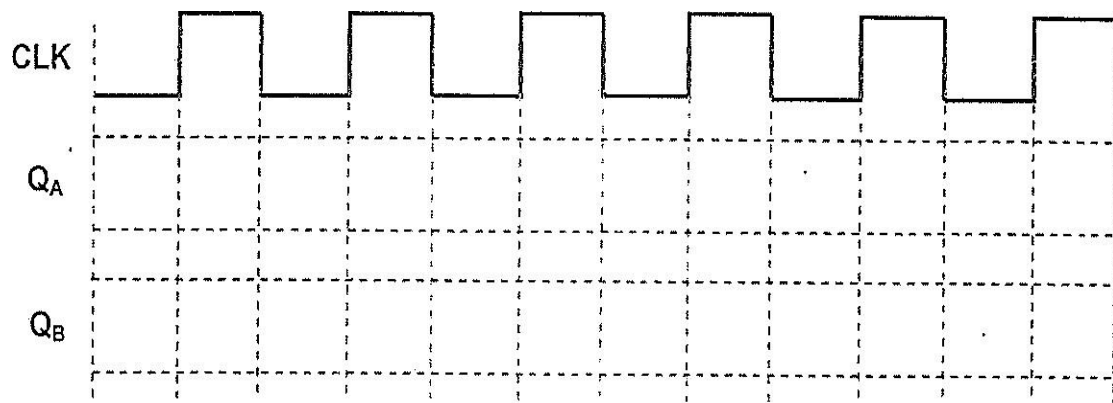


Figure Q4(b)(i)/ *Rajah Q4(b)(i)*

[100 MARKS/ MARKAH]

END OF QUESTION PAPER / *KERTAS SOALAN TAMAT*