

**SECTION A: 60 MARKS**  
**BAHAGIAN A: 60 MARKAH**

**INSTRUCTION:**

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  
C1

- a) Define automation control system.  
*Takrifkan sistem kawalan automatik.*

[3 marks]  
[3 markah]

CLO1  
C3

- b) Sketch the symbol for the following types of relays.  
*Lakarkan simbol bagi jenis geganti yang berikut*
- i. SPDT
  - ii. DPST
  - iii. DPDT

[6 marks]  
[6 markah]

CLO2  
C3

- c) Draw a circuit diagram that shows the contactor coil usage in the motor control system.  
*Lukiskan gambarajah litar yang menunjukkan penggunaan gegelung penyentuh dalam sistem kawalan motor.*

[6marks]  
[6 markah]

## QUESTION 2

## SOALAN 2

CLO1  
C2

a) Choose the most suitable logical proximity sensors for the following objects.

*Pilih penderia penghampiran logic yang sesuai untuk objek berikut.*

- i. Plastic bottle  
*Botol plastik*
- ii. Glass bottle  
*Botol gelas*
- iii. Wooden box  
*Kotak kayu*
- iv. Metal plate  
*Kepingan logam*

[4 marks]

[4 markah]

CLO1  
C2

b) Figure A1(b) shows a PLC building structure. Identify each of the items (a),(b),(c) and (d) below.

*Rajah A1 menunjukkan binaan struktur PLC. Kenalpasti setiap item (a),(b),(c) dan (d) di bawah.*

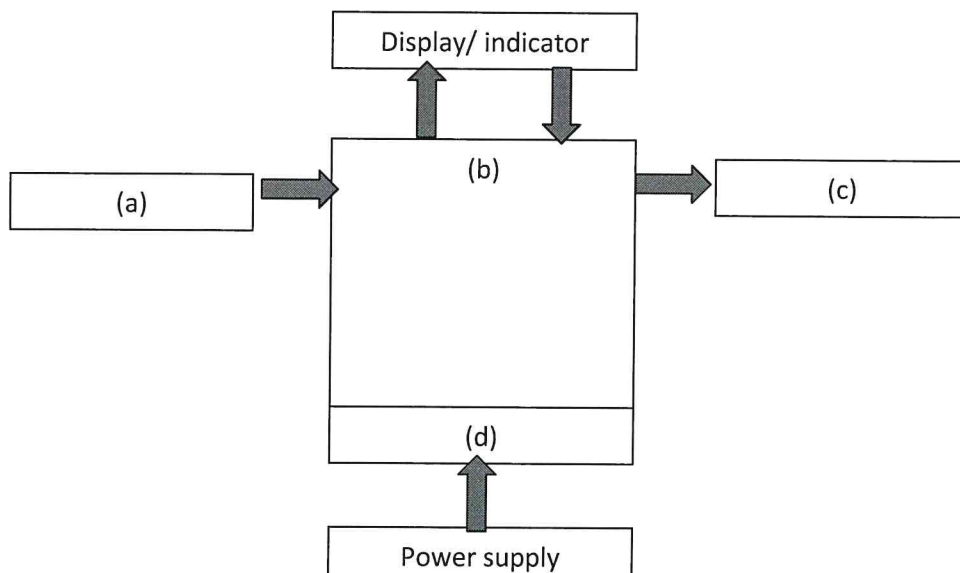


Figure A1 (b)/Rajah A1 (b)

[4 marks]  
[4 markah]

CLO2  
C3

- c) By using the concept of self-holding /latching circuit, draw the Relay Ladder Logic (RLL) control circuit, which will enable a 3-phase motor to run when the push button switch / sensor (START) is enabled. The operation of the control circuit will be stopped immediately if another switch/sensor (STOP) is enabled or stopped automatically after 10 seconds of its operation.

*Dengan menggunakan konsep kawalan pegang diri, lukiskan satu litar kawalan Relay Ladder Logic(RLL) yang akan mengaktifkan sebuah motor 3 fasa untuk berputar apabila satu suis punat tekan/pengesan (START) diaktifkan. Operasi litar kawalan ini akan dihentikan sebaik sahaja satu lagi penderia(STOP) diaktifkan ATAU dihentikan secara automatik setelah 10 saat sistem beroperasi.*

[7marks]

[7 markah]

**QUESTION 3**

**SOALAN 3**

CLO1  
C1

- a) List **FOUR (4)** programming languages for PLC.  
*Senaraikan EMPAT (4) bahasa pengaturcaraan PLC*

[2 marks]

[2 markah]

CLO1  
C2

- b) By referring to the ladder diagram as shown in Figure A2(b), identify the elements A,B,C,D and E.

*Dengan merujuk kepada rajah tangga seperti pada Rajah A2(b), kenalpasti elemen A,B,C,D dan E.*

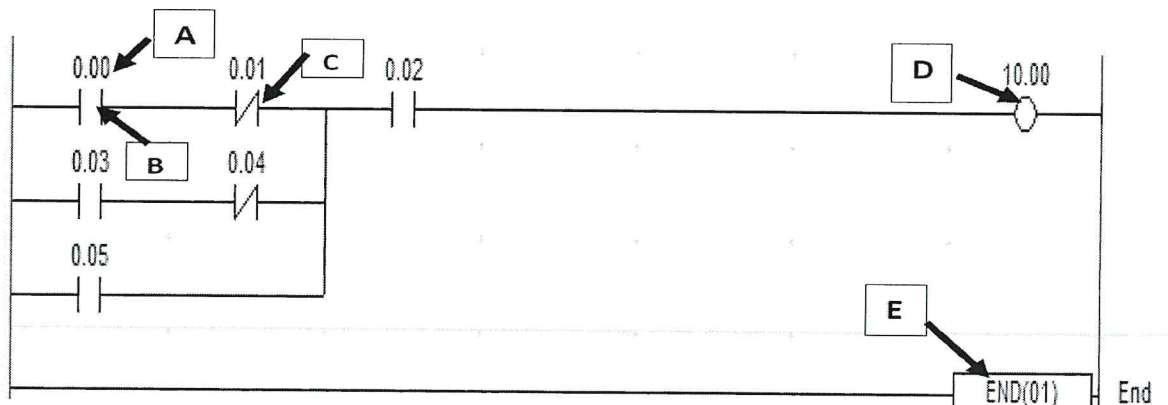


Figure A2 (b) /Rajah A2 (b)

[5 marks]

[5 markah]

CLO2  
C3

- (c) By using the basic timer instruction, draw a ladder diagram which would produce a timing diagram as in Figure A3(c)

*Dengan menggunakan arahan pemasa, lukis satu rajah tangga yang dapat memberikan keluaran seperti rajah pemasaan di dalam Rajah A3(c)*

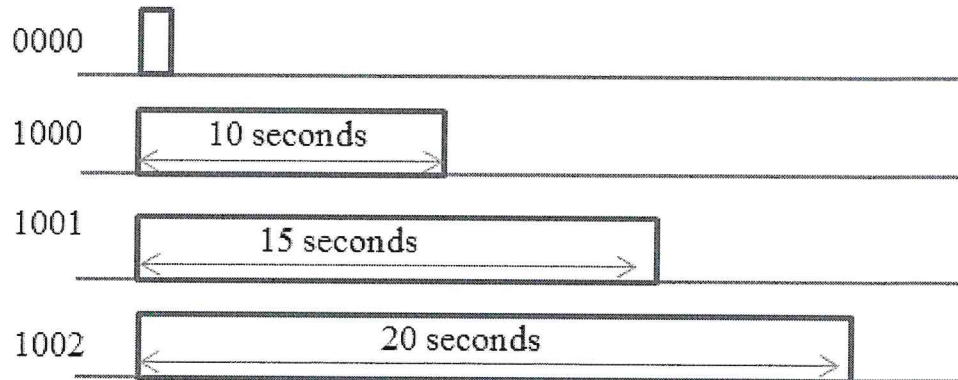


Figure A3(c)/ *Rajah A3(c)*

[8 marks]  
[8 markah]

#### QUESTION 4

#### SOALAN 4

CLO1  
C1

- a) State **TWO (2)** conditions that must be taken for consideration during the installation of PLC systems.

*Nyatakan DUA (2) keadaan yang perlu dipertimbangkan semasa membuat pemasangan sistem PLC.*

[3 marks]  
[3 markah]

CLO1  
C3

- b) Describe **THREE (3)** precautions when handling the PLC wiring system.

*Terangkan TIGA (3) langkah berjaga-jaga semasa kerja pendawaian system PLC dijalankan.*

[6 marks]  
[6 markah]

- c) When Push Button 0 (00000) is pressed for 5 times, the Lamp 1 (10000) will be ON. When the Lamp 1 is ON, TIM 001 will be activated and after 3 seconds, Lamp 2 (10001) will be OFF. Use Switch 1 (00001) as the reset button. Draw a ladder diagram based on the given statement.

*Apabila suis punat tekan 0 (00000) ditekan sebanyak 5 kali, keluaran lampu 1 (10000) akan HIDUP. Bila keluaran lampu 1 (10000) HIDUP, TIM 001 akan diaktifkan dan selepas 3 saat keluaran lampu 2 (10001) akan MATI. Gunakan suis masukan 00001 sebagai suis reset. Daripada kenyataan yang diberikan lukiskan tatarajah tetangga.*

[6 marks]

[6 markah]



**SECTION B: 40 MARKS****BAHAGIAN B: 40 MARKAH****INSTRUCTION:**

This section consists of **TWO (2)** essay questions. Answer **TWO (2)** questions only.

**ARAHAN:**

*Bahagian ini mengandungi DUA (2) soalan esei. Jawab DUA (2) soalan sahaja.*

**QUESTION 1****SOALAN 1**

Figure B1(a) shows a part of milk packaging production line to separate any empty cartons from those filled with milk. The system will only be activated when the START button is pressed. After the Start button is pressed and released, the RED light will blink for 5 seconds. Following that, motors M1 and M2 which control conveyor A and B respectively will start rotating and move the cartons of milk. A proximity sensor will sense which carton is empty and will cause cylinder CY1 to extend and push the empty carton into conveyor B. The cylinder will then retract automatically. Normal cartons (those filled with milk) will be sent via conveyor A to the packaging area. With reference to Figure B1(a) and Figure B1 (b) and Figure B1(c), list the devices with appropriate specifications and draw the conventional sequential control diagram of the production system.

*Rajah B1(a) menunjukkan sebahagian baris pengeluaran pembungkusan susu kotak (susu karton) yang mengasingkan kotak susu yang kosong dengan yang telah diisi. Sistem ini hanya akan diaktifkan setelah suis START ditekan, Apabila suis START ditekan dan dilepaskan, lampu MERAH akan berkelip selama 5 saat. Setelah itu, Motor 1 dan Motor 2 yang mengawal talisawat A dan B masing-masing akan mula berputar dan menggerakkan karton-karton susu. Satu penderia proximity digunakan untuk mengesan karton yang kosong dan menyebabkan selinder CY1 keluar dan menolak karton susu yang kosong ke tali sawat B. Selinder CY1 akan kembali ke keadaan asal secara automatik. Karton susu yang normal (yang berisi susu) akan meneruskan perjalanan mereka pada tali sawat A ke bahagian pembungkusan. Dengan merujuk kepada Rajah B1 (a), Rajah B1(b) dan rajah B1(c) senaraikan peranti-peranti dengan spesifikasi yang bersesuaian dan lukiskan litar jujukan kawalan konvensional sistem pengeluaran tersebut.*

CLO2  
C3

SULIT

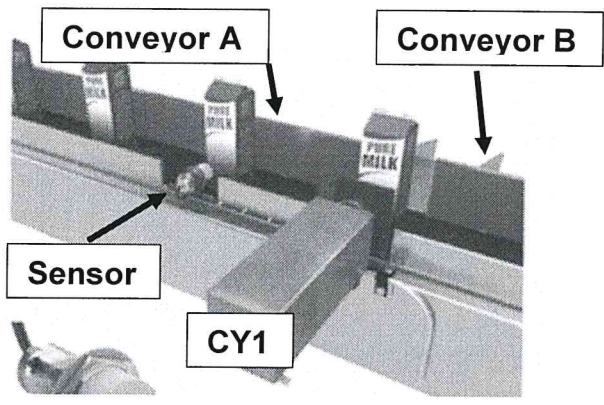


Figure B1(a) Milk Packaging Production Line (Normal condition)

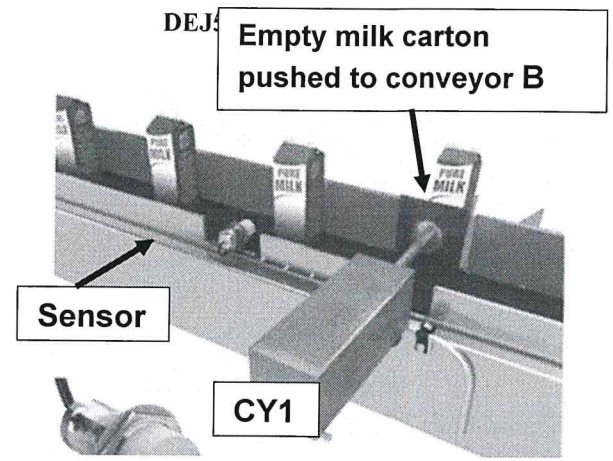


Figure B1(b) Milk Packaging Production Line (When an empty carton is detected)

SEQUENCE	ELECTRICAL PARTS														
1	PB1 (START) SWITCHING LATCH CIRCUIT														
	TIMER PRESET VALUE (PV)														
2	TIMER OUTPUT (RESET)														
	RED LAMP (TIMER OUTPUT)														
	CONTROL RELAY 1 (MOTOR A)														
3	CONTROL RELAY 2 (MOTOR B)														
	PROXIMITY SENSOR														
4	CYLINDER CY1														

Figure B1 (c) Timing Sequence Diagram of Milk Packaging System

[20 marks]

[20 markah]

**QUESTION 2**

**SOALAN 2**

CLO2  
C5

When the start button is pressed and released, the siren will be activated for 5 minutes. After that motor 1 will rotate and conveyor 1 will move. Sensor S1 will count 24 times and inserting objects into the box. After 24 counts, motor 1 will be stopped while motor 2 is ON. Then sensor S2 will move the conveyor 2. At the same time motor 2 will be stopped while motor 1 will be ON. This process will continue until the stop button is pressed. According to the situation in Figure B2 and table B2, construct the ladder diagram and show the mnemonic codes of the system.

*Apabila butang mula ditekan dan dilepaskan, siren akan berbunyi selama 5 minit. Selepas motor 1 akan berputar dan penghantar 1 akan bergerak. Pengesan S1 akan mengira 24 kali dan memasukkan objek ke dalam kotak. Selepas hanya 24 kiraan, motor 1 akan berhenti dan motor 2 adalah ON. Kemudian pengesan S2 akan menggerakkan penghantar 2. Dalam masa yang sama, motor 2 akan berhenti dan motor 1 akan ON. Proses ini akan berterusan sehingga butang henti ditekan. Merujuk kepada rajah B2 dan jadual B2, bina rajah tangga PLC dan tunjukkan kod mnemonikj untuk sistem tersebut*

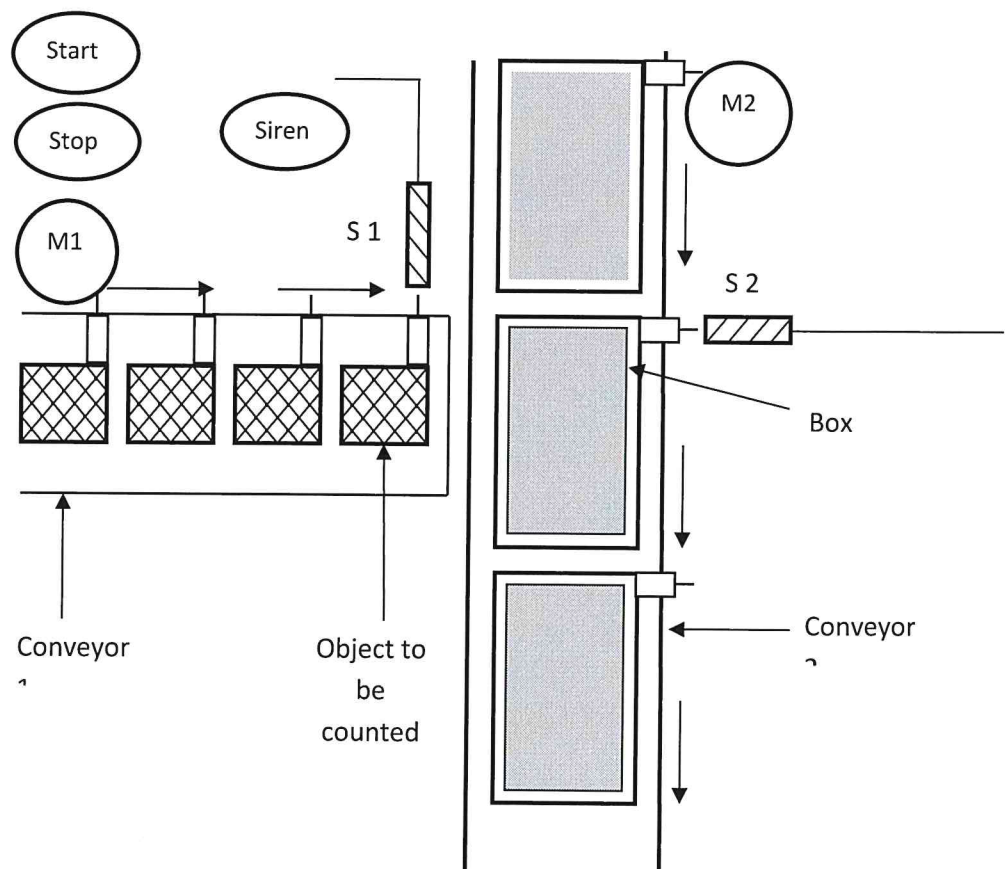


Figure B2/ Rajah B2



Legend:

Input	Devices
00000	Start Button
00001	Sensor 1
00002	Sensor 2
00003	Stop Button

Output	Devices
01000	Siren
01001	Motor 1
01002	Motor 2

Table B2 / *Jadual B2*

[20 marks]

[20markah]

SOALAN TAMAT