

**SECTION A : 80 MARKS**  
**BAHAGIAN A : 80 MARKAH**

**INSTRUCTION:**

This section consists of **FOUR (4)** structured question. Answer all questions.

**ARAHAN :**

*Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab semua soalan.*

**QUESTION 1**

**SOALAN 1**

CLO 1  
C1

- a) Nowadays, automation control system is very crucial because it can improve the quality and increase the productivity of all activities in industrial sectors and our daily life.

Give a definition of Automation Control System.

*Pada ketika ini, sistem kawalan automasi sangat diperlukan kerana ianya dapat meningkatkan kualiti dan menambahkan produktiviti dalam sektor perindustrian dan semua aktiviti kehidupan harian kita . Berikan definisi sistem kawalan automasi.*

[4 marks]

[4 markah]

CLO 1  
C2

- b) A simple system uses two push-button (Normally Open and Normally Closed) to turn ON and turn OFF a light. It uses the concept of holding/latching circuit. Visualize the conventional control sequence (RLL/hardwired diagram) of the system that uses electromechanical relay.

*Sebuah sistem yang mudah menggunakan dua (2) punat tekan (Sedia Buka dan Sedia Tutup) untuk mehidupkan dan mematikan sebuah lampu. Ia menggunakan konsep litar "holding/latching". Gambarkan jujukan kawalan konvensional (RLL/Hardwired diagram) tersebut yang menggunakan geganti elektromekanikal.*

[6 marks]

[6 markah]

CLO 1  
C3

c) By referring to the sequence timing chart Figure A1c, draw the conventional control sequence (RLL/hardwired diagram) of this system.

*Dengan merujuk kepada carta jujukan kawalan pada Rajah A1c, lukiskan jujukan kawalan konvensional (RLL/hardwired diagram) bagi sistem ini.*

[10 marks]

[10markah]

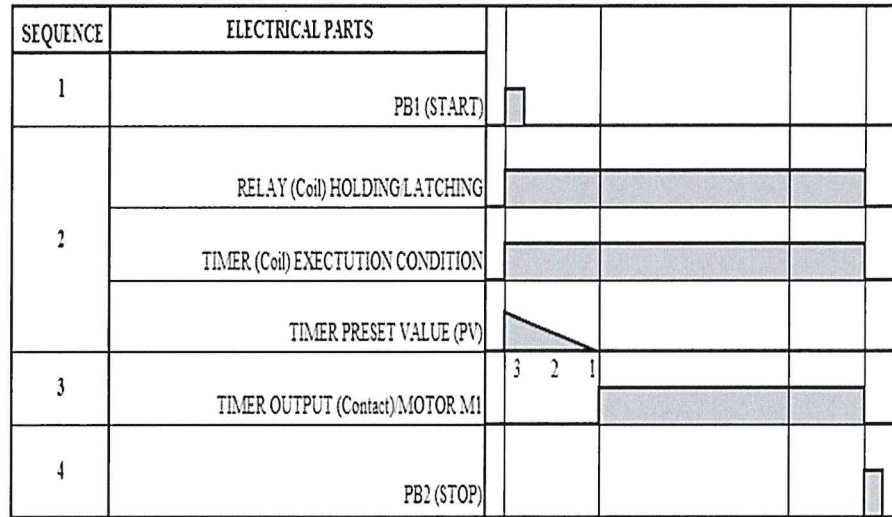


Figure A1c / Rajah A1c

**QUESTION 2**

**SOALAN 2**

CLO1  
C1

a) List **TWO** (2) types of digital input and **TWO** (2) types of digital output.  
Senaraikan **DUA** (2) jenis input digital dan **DUA** (2) jenis output digital.

[4 marks]

[4 markah]

CLO1  
C2

b) Explain the functions of solenoid, port and way in a 5/2 solenoid valve operation.  
*Jelaskan fungsi solenoid, port dan arah dalam kendalian operasi injap solenoid 5/2.*

[6 marks]

[6 markah]

CLO1  
C3

- c) Construct the conventional control sequence (RLL/Hardwired diagram) for the operation below.

When the input push button 1 (PB1) is pressed for 5 times, the output will be turned ON. When the output is ON, TIM001 will be activated and after 3 seconds, output 1 will be turned OFF. Use input push button 2 (PB2) as the reset button.

*Bina jujukan kawalan konvensional (RLL/hardwired diagram) bagi operasi di bawah.*

*Apabila suis ditekan masukkan 1 (PB1) ditekan 5 kali, keluaran akan ON. Apabila keluaran ON, TIM001 akan aktif dan selepas 3 saat keluaran 1 akan OFF. Gunakan masukkan 2 (PB 2) sebagai butang reset.*

[10 marks]

[10 markah]

**QUESTION 3****SOALAN 3**CLO1  
C1

- a) Describe the Definition of PLC by National Electrical Manufacturers Association US (NEMA)

*Terangkan secara ringkas Definisi PLC oleh National Electrical Manufacturers Association US (NEMA)*

[4 marks]

[4 markah]

CLO1  
C2

- b) By using appropriate diagram of PLC, explain the PLC components function of CPU Unit, and I/O Unit.

*Dengan menggunakan gambarajah PLC yang bersesuaian, terangkan secara ringkas fungsi komponen PLC bagi CPU Unit dan I/O Unit*

[6 marks]

[6 markah]

CLO1  
C3

- c) Construct 3 NPN transistor input and 3 PNP transistor output in PLC wiring using sinking and sourcing technique.

*Bina 3 kemasukan transistor NPN dan 3 keluaran transistor PNP dalam pendawaian PLC menggunakan teknik "sinking" dan "sourcing".*

[10 marks]

[10 markah]

**QUESTION 4****SOALAN 4**CLO1  
C1

- a) Consider PLC operation, maintenance, and surrounding conditions when installing the PLC in a panel or cabinet. The operating temperature range for the PLC is 0°C to 55°C. Be sure that there is an adequate ventilation for cooling. State **TWO** (2) method to ensure that there is adequate ventilation for cooling.

*Pertimbangkan operasi, penyelenggaraan, dan keadaan PLC semasa memasang PLC dalam panel atau kabinet. Julat suhu operasi untuk PLC adalah 0 ° C hingga 55 ° C. Pastikan pengudaraan yang mencukupi untuk penyejukan.*

*Nyatakan **DUA** (2) kaedah bagaimana untuk memastikan pengudaraan yang mencukupi untuk penyejukan.*

[4 marks]

[4 markah]

CLO1  
C3

- b) As the person in charge of PLC maintenance, you are required to carry out preventive maintenance for PLC. Write down **FOUR (4)** preventive maintenance methods to ensure the PLC will not damage during the operation.

*Sebagai individu yang bertanggungjawab ke atas penyenggaraan PLC, anda juga perlu melaksanakan penyenggaraan pencegahan untuk PLC. Tuliskan EMPAT(4) kaedah penyenggaraan pencegahan bagi memastikan PLC tidak rosak semasa sedang beroperasi.*

[8 marks]

[8 markah]

CLO1  
C3

- c) Sketch the ladder diagram for the operation below:  
When the switch 1 is pressed for 5 times, light A will turned ON. After three (3) seconds light A will turned OFF and light B will also turned ON. Both lights will be turned off whenever switch 2 is pressed.

*Lakarkan gambarajah tangga bagi operasi di bawah:*

*Apabila suis 1 ditekan sebanyak 5 kali, lampu A akan menyala, Selepas tiga (3) saat lampu A padam, lampu B akan menyala, Kedua-dua lampu tersebut akan padam apabila suis 2 ditekan.*

[8 marks]

[8 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 diberikan

## QUESTION 1

## SOALAN 1

These three products have to go through station A and B before they are packed in a box. To carry out that process, several sequences need to be followed. The system operation is as follows:

*Tiga produk perlu melalui stesyen A dan B sebelum ianya dibungkus ke dalam kotak. Beberapa jujukan kawalan perlu dijalankan untuk proses pembungkusan tersebut. Operasi sistem ini adalah seperti berikut :*

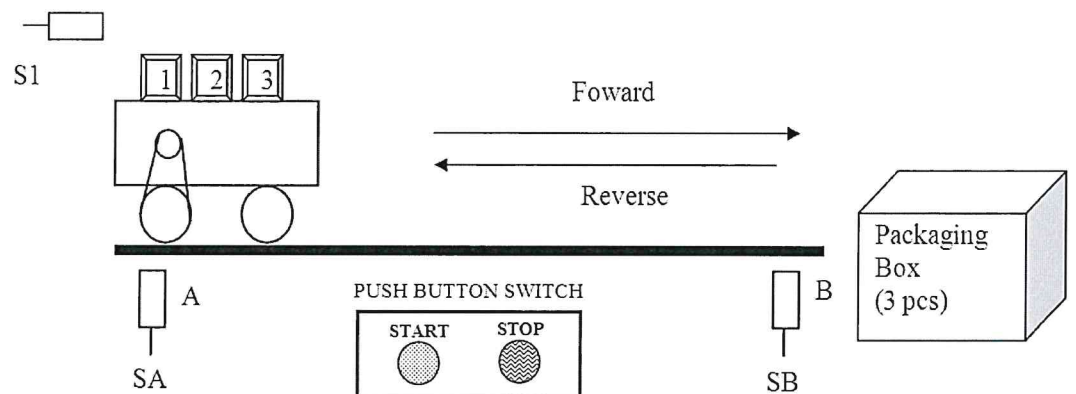


Figure B1/Rajah B1

1. Push-button switch (START-0000 & STOP/RESET-0001) is used to start and stop/reset this system operations.
2. Sensor S1-0002 detects the presence of 3 products. (Trolley stand by to move forward)

3. When START-0000 button is pressed with sensor SA-0003 in the ON state (trolley at station A) and after the presence of 3 products, the trolley will move forward-1000 to station B.
4. Once the trolley reaches station B (sensor SB-0004 turned on), the trolley stops and at the same time a timer TIM starts to function.
5. After a 3 seconds delay time, the trolley will move backward-1001 to station A.
6. The trolley stops when it reaches station A (when SA is turned on).
7. To restart the system, the user must reset the system and reactivate the START push button.

1. *Suis punat tekan (START-0000 & STOP/RESET-0001) digunakan untuk mengaktifkan dan mematikan/mereset operasi sistem ini.*
2. *Penderia SI-0002 mengesan 3 produk. (troli di station A bersedia untuk mara)*
3. *Apabila suis punat tekan START-0000 diaktifkan dengan pengesanan SA-0003 dalam keadaan "ON" serta setelah kehadiran 3 produk, troli akan bergerak mara-1000 ke station B.*
4. *Troli tersebut akan berhenti apabila sampai ke station B (pengesanan SB-0004 "ON") dan pada masa yang sama pemasa TIM akan mula beroperasi.*
5. *Setelah lengah masa 3 saat troli tersebut akan bergerak mengundur-1001 ke station A.*
6. *Troli tersebut akan berhenti beroperasi apabila sampai ke station A iaitu apabila pengesanan SA "ON".*
7. *Untuk mengaktifkan kembali sistem ini, pengguna perlu "mereset" kembali sistem dan mengaktifkan kembali suis START.*

CLO1  
C5

By referring to Figure B1 and the sequence explanation, propose a complete i/o wiring & PLC Ladder diagram for the system.

*Berpandukan Rajah B1 dan berdasarkan jujukan kawalan yang diberikan, cadangkan pendawaian i/o serta rajah tangga PLC untuk sistem tersebut.*

[20 marks]

[20 markah]

**SOALAN TAMAT**