SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2017

DEJ5153 : PROGRAMMABLE LOGIC CONTROLLER (PLC) AND AUTOMATION

TARIKH : 31 OKTOBER 2017
MASA : 2.30 PETANG - 4.30 PETANG (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

Bahagian A: Struktur (4 soalan)
Bahagian B: Esei (2 soalan)

Dokumen sokongan yang disertakan: Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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) Automation system is divided into two types: fixed automation and programmable automation, list **THREE (3)** differences between the two types of automation.

*Sistem automasi terbahagi kepada dua jenis iaitu automasi tetap dan automasi diprogramkan, senarai **TIGA (3)** perbezaan bagi kedua-dua jenis automasi tersebut.*

[3 marks]
[3 *markah*]

CLO1
C3

b) By using appropriate diagram, draw the following type of relay:

Dengan menggunakan rajah yang sesuai, lukiskan jenis geganti berikut:

i. SPDT
ii. DPST
iii. DPDT

[6 marks]
[*6 markah*]

CLO2
C3

c) Draw a detail hardwire ladder diagram of the control relay operation:

"Lamp 1 ON after start push-button is pressed and when stop push- button is press the lamp 1 OFF"

Lakarkan gambar litar konvensional yang terperinci tentang pengendalian kawalan geganti:

"Lampu 1 ON selepas punat tekan mula ditekan dan apabila punat tekan henti ditekan lampu 1 OFF"

[6 marks]
[*6 markah*]

QUESTION 2

SOALAN 2

CLO1 C2

a) Outline **FOUR (4)** advantages of PLC.
*Berikan **EMPAT (4)** kelebihan PLC.*

[4 marks]
[*4 markah*]

CLO1 C2

b) By referring to **Figure A2(b)**, Basic Structure of PLC below, identify the parts marked A, B, C and D.
*Dengan merujuk **Rajah A2(b)**, Struktur Asas PLC di bawah, kenalpasti bahagian bertanda A, B, C and D.*

[4 marks]
[*4 markah*]

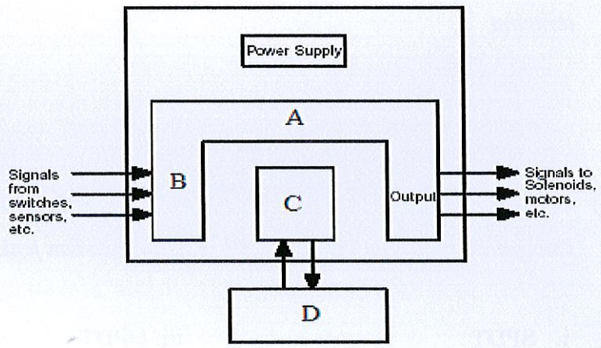


Figure A2(b) / *Rajah A2(b)*

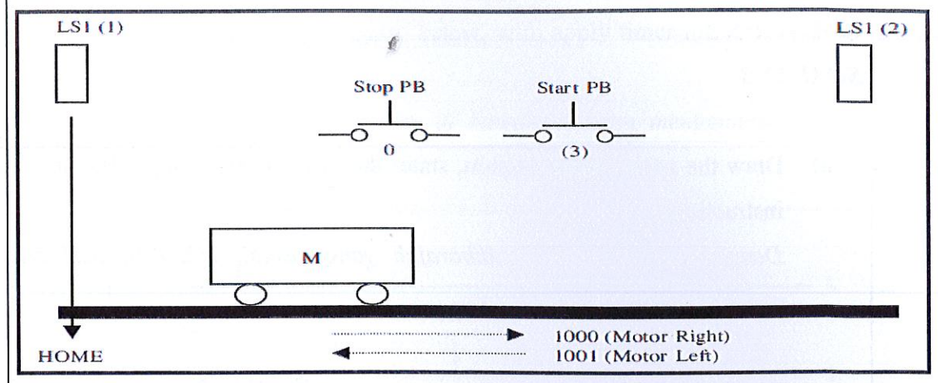


Figure A2(c)/ Rajah A2(c)

CLO2 C3

c) Sketch the timing sequence chart for the conventional or hardwire system in **Figure A2(c)**:
"The start button is pressed, the motor (M) will move from left to right. When LS2 is switched ON, the Motor stops. After a delay of 5 seconds, the motor moves back to Home position and when LS1 (Home) is switched ON, Motor cuts off signifying that the sequence is complete."

*Lukiskan carta jujukan masa bagi pendawaian konvensional (Relay Ladder Logic) pada **Rajah A2(c)**:*
"Butang mula ditekan, motor (M) akan bergerak dari kiri ke kanan. Apabila LS2 ON, Motor akan berhenti. Selepas lengah masa 5 saat, Motor bergerak semula ke kedudukan asal. Apabila LS1 (Home) adalah ON, Motor terhenti menandakan bahawa urutan selesai. "

[7 marks]
[*7 markah*]

QUESTION 3

SOALAN 3

CLO1
C1

a) Draw the appropriate diagram, state the differences of the following basic logic instruction sets:

Dengan menggunakan gambarajah yang sesuai, nyatakan perbezaan set-set arahan berikut:

i. AND LD

ii. OR LD

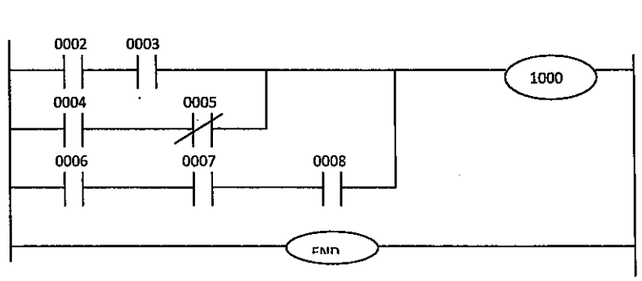
[2 marks]

[*2 markah*]

CLO1
C2

b) Based on the following ladder diagram, list the mnemonic code.

Berdasarkan rajah tangga di bawah, senaraikan kod mnemonik.



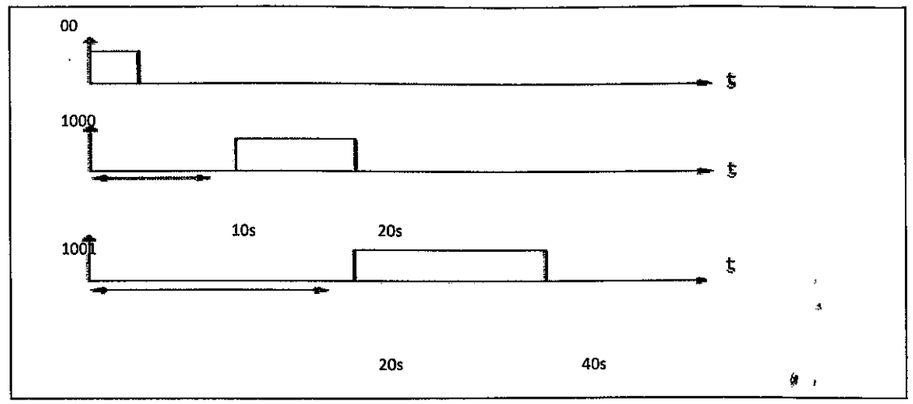
[5 marks]

[5 *markah*]

CLO2
C3

c) Based on the timing diagram below, with apply timer instruction, draw the ladder diagram.

Berdasarkan rajah pemasaan di bawah, dengan menggunakan arahan pemasa lukiskan gambarajah tangga.



[8 marks]

[*8 markah*]

QUESTION 4

SOALAN 4

CLO1
C1

a) List **THREE (3)** preventive maintenance steps that can be used for PLC installation.

*Senaraikan **TIGA (3)** langkah-langkah senggaraan pencegahan yang boleh digunakan untuk pemasangan PLC.*

[3 marks]

[*3 markah*]

CLO1
C3

b) The following are two of the three PLC wiring installation method. Draw and label complete wiring diagram for:

Berikut ialah dua daripada tiga kaedah pemasangan pendawaian PLC. Lukiskan dan labelkan dengan lengkap rajah pendawaian bagi:

i. Handing Ducts wiring method / *kaedah pendawaian 'Handing Ducts'*

ii. Ducts Floor wiring method / *Kaedah pendawaian 'Ducts Floor'*

[6 marks]

[*6 markah*]

CLO2
C3

c) **Figure A2** shows a simple car park control system that will only allow 50 cars at a parking space. Sensor (0002) will detects every time when a car enters and the automatic car park gate (1001) will open for 5 seconds to allow the car to come in. When 50 cars are detected by the detector (0002), the sign board (1002) will show 'NO ENTRY'. Based on operating stated, illustrate the ladder diagram.

***Rajah A2** di bawah menunjuk satu sistem kawalan tempat letak kereta yang menyediakan 50 tempat letak kereta. Pengesan (0002) akan mengesan setiap kali kehadiran kereta dan palang automatik (1001) akan dibuka selama 5 saat bagi membolehkan kereta masuk. Apabila pengesan (0002) telah mengesan sebanyak 50 buah kereta, papan tanda (1002) akan memaparkan 'NO ENTRY'. Berdasarkan kepada kendalian tersebut, gambarkan rajah tangga.*

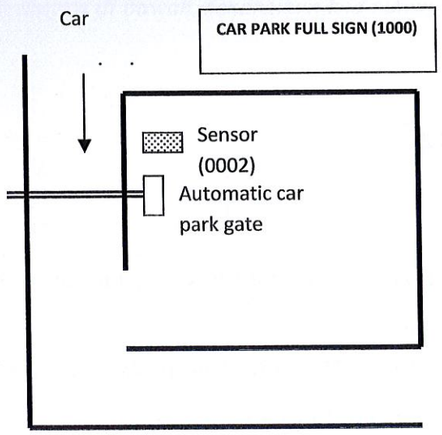


Figure A2/Rajah A2

[6 marks]
[*6 markah*]

SECTION B: 40 MARKS
BAHAGIAN B: 40 MARKAH

INSTRUCTION:
This section consists of **TWO (2)** essay questions. Answer **ALL** questions.
ARAHAN:
*Bahagian ini mengandungi **TWO (2)** soalan esei. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

CLO2
C3

Refer to the **Figure B1(i)** below, it shows the system connection to control the traffic light. The traffic light will operate based on the following sequence in **Figure B1(ii)**. Sketch in detail the conventional sequential controls ladder of the traffic light system by control using timer-delay relays and contactors. Then from conventional sequential controls ladder explain the operation of the traffic light.

*Rujuk kepada **Rajah B1(i)** di bawah, ia menunjukkan sambungan sistem untuk mengawal lampu isyarat. Lampu isyarat akan beroperasi dalam mengikuti urutan seperti di **Rajah B1(ii)**. Lakarkan secara terperinci konvensional kawalan berjujukan tangga sistem lampu isyarat dengan kawalan menggunakan geganti pemasa dan penyentuh. Kemudian dari kawalan berjujukan tangga konvensional tersebut, terangkan operasi lampu isyarat.*

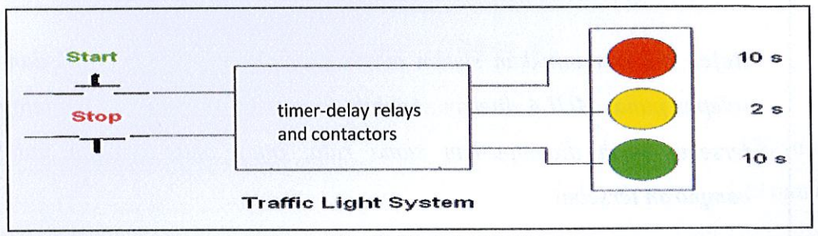


Figure B1 (i)/*Rajah B1 (i)*

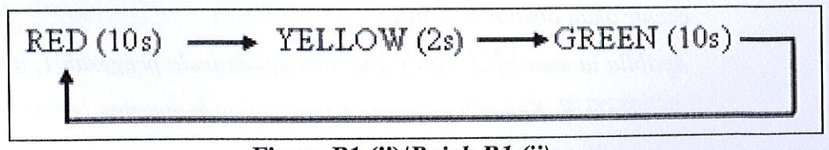


Figure B1 (ii)/*Rajah B1 (ii)*

[20 marks]
[*20 markah*]

QUESTION 2

SOALAN 2

CLO2
C5

Figure B2 show an automatic system infusing liquids A and B in a container after START push button is pressed.When it reaches the set level, the two liquids mixed evenly and the valve will open to release the mixture.

The operation is:

- When the START push button is pressed, valve inlet A and B will OPEN. Liquid will flow to the tank.
- When it reaches the set level at sensor 1, valve inlet A and inlet B will be CLOSED. Then, the motor will ON and the two liquids will be mixed for 10 seconds.
- After 10 seconds, motor OFF and the solenoid is OPEN to release the mixture. When it reaches sensor 2 the solenoid will CLOSE.
- The operation will be repeated for 10 cycles.
- Stop push button is used as an emergency button.

Base on operation above list the input and output devices data, design the ladder diagram and transfer the ladder diagram to mnemonic code.

Rajah B2 *menunjukkan sistem automatik penyebatian cecair A dan B dalam tangki selepas punat MULA ditekan. Apabila ia mencapai tahap yang ditetapkan, dua cecair tersebut telah dicampurkan sama rata, injap akan terbuka untuk mengeluarkan campuran tersebut.*

Kendalian tersebut adalah:

- *Apabila punat tekan MULA ditekan, injap cecair A dan cecair B akan TERBUKA cecair akan disalur ke tangki.*
- *Apabila ia mencapai tahap yang ditetapkan pada pengesan 1, injap A dan B akan TERTUTUP. Kemudian, motor akan ON dan kedua-dua cecair akan dicampurkan selama 10 saat.*

- *Selepas 10 saat motor OFF dan solenoid TERBUKA untuk mengeluarkan campuran hingga ia mencapai tahap yang ditetapkan pada pengesan 2, solenoid akan TERTUTUP.*
- *Operasi itu akan berulang untuk 10 kitar.*
- *Punat tekan HENTI digunakan sebagai butang kecemasan.*

Berdasarkan kendalian tersebut senaraikan data peranti untuk masukan dan keluaran,rekakan rajah tangga dan pindahkan rajah tangga ke kod mnemonik

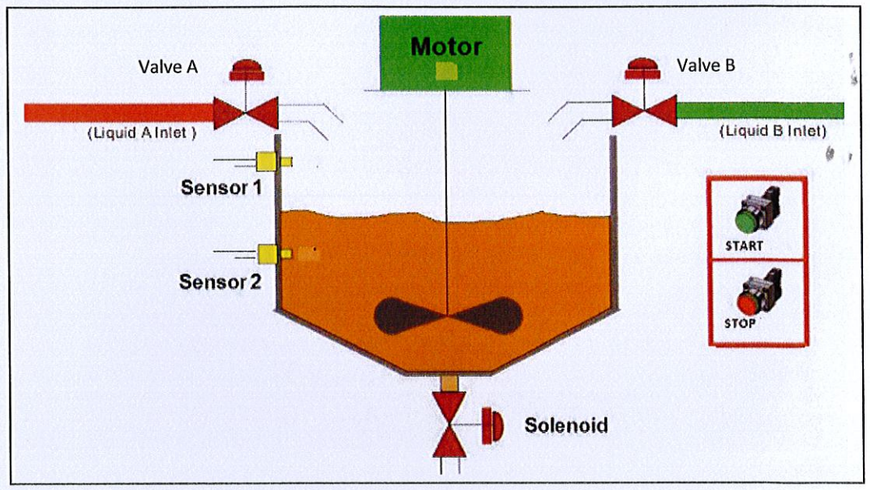


Figure B2/*Rajah B2*

[20 marks]
[*20 markah*]

SOALAN TAMAT