Question Paper

Exam Date & Time: 18-Apr-2018 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
FOURTH SEMESTER B.S (ENGG)
END-SEMESTER THEORY EXAMINATIONS APRIL - 2018
DATE : 18 APRIL 2018
TIME : 9:30AM TO 12:30PM

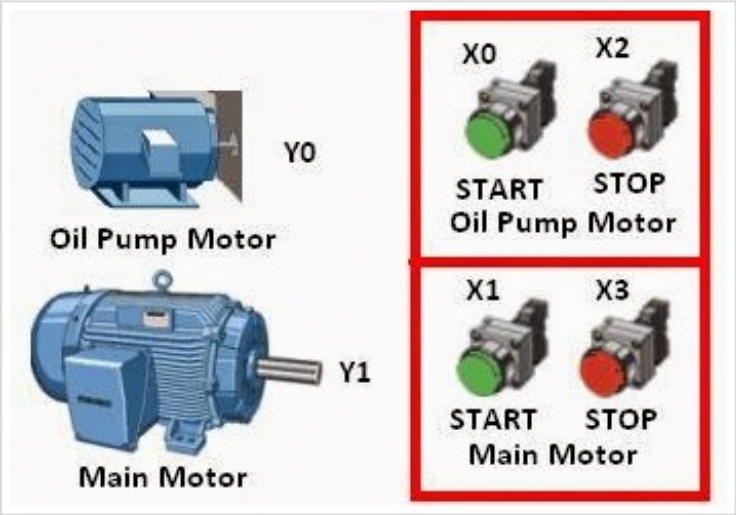
Programmable Logic Controller [MET 244]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

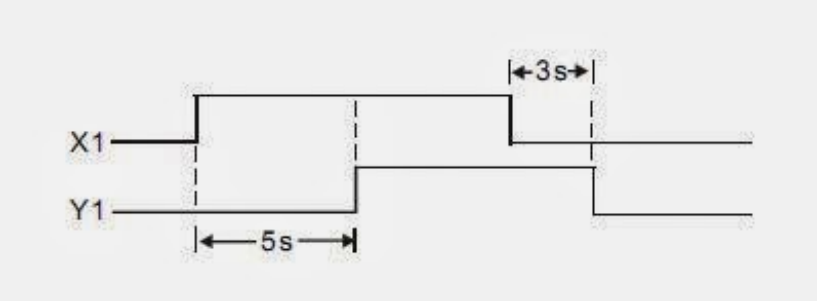
Missing data, if any, may be suitably assumed

1)		What is Automation? Explain Brief history of Automation with advantages and disadvantages in each evaluation	(8)
	A)		
	B)	Elaborate on SCADA? Explain different types of system Architectures with the help of block diagrams?	(8)
	C)	Briefly explain the concept of comparison function blocks.	(4)
2)		With an example explain & compare the following instructions	(6)
	A)	i) ISKIP and MCR ii) Jump and Jump with return	
	B)	Draw PLC ladder diagram to Implement 2-bit Magnitude Comparator.	(8)
	C)	Discuss different network topologies with the sketch diagrams.	(6)
3)		Describe in detail the Scan cycle of PLC.	(6)
	A)		
	B)	Construct the truth table, Boolean expression and ladder diagram for XOR and XNOR.	(6)
	C)	Draw the PLC ladder logic for the following operation: Providing lubricant for the gear box before the lathe spindle starts to run which aims to ensure that the oil pump motor starts first and the main motor starts subsequently	(8)



4) Draw the PLC ladder logic for the following operation: (6)

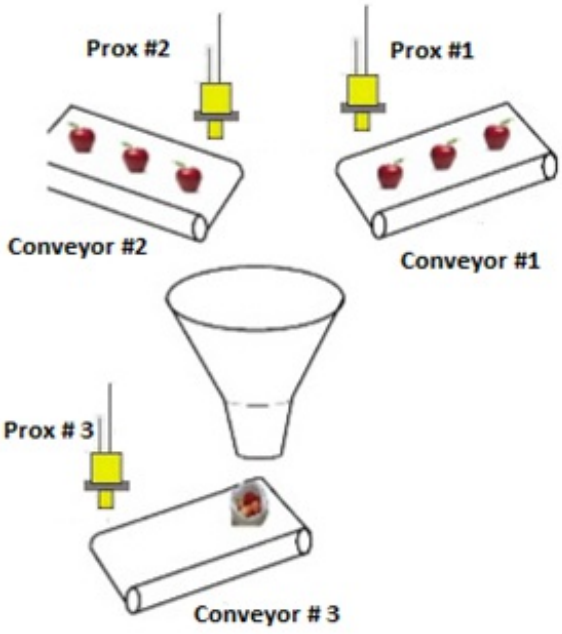
A) Enabling the indicator to be ON after a 5 sec delay and OFF after a 3 sec delay by the switch



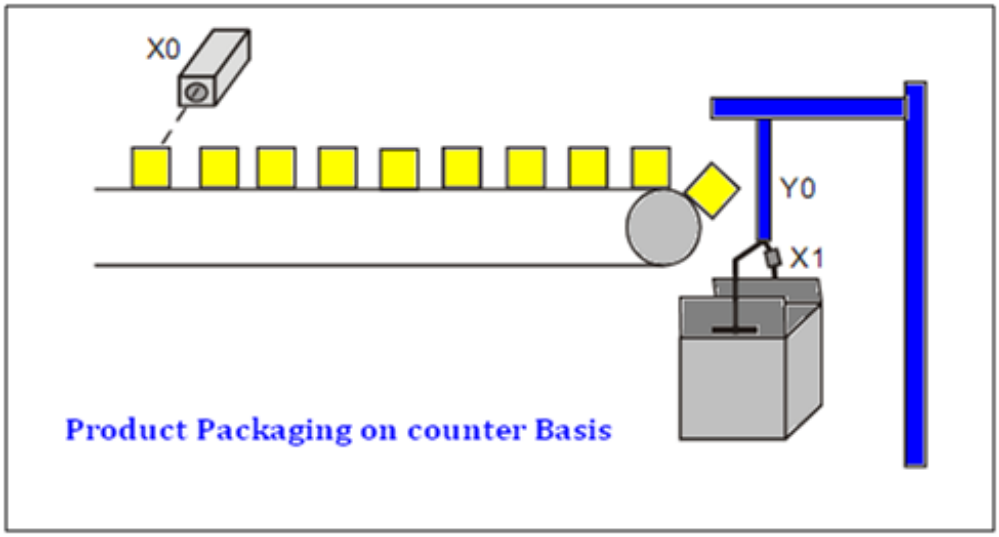
B) Simulate the following function using ladder logic. (6)

$$x = \operatorname{atan}\left(y\left(\frac{y+\log(y)}{y+1}\right)\right)$$

C) Draw the PLC Ladder logic diagram for a packaging system. The system drops apples in to bag. The apples come in to system on conveyor #1 AND on conveyor #2. Proximity switch #1, at the end of conveyor #1, counts the apples as they go by. Proximity switch #2, at the end of conveyer #2, also counts apples as they go by. When the TOTAL combined apple count is at 12, (12 apples in bag) conveyor #1 and conveyor #2 stops. This turn ON conveyor #3. Conveyor #3 is ON until prox #3 is ON. When prox#3 is ON conveyor #3 turns OFF and conveyor #1 and conveyor #2 turn back ON, the counter resets and the system starts over. (8)



5) A) Once the photoelectric sensor (X0) detects 10 products, the robotic arm will begin to pack up. When the action is completed, the robotic arm and the counter will be reset. (5)



B) Draw PLC ladder logic to Implement Binary to Gray Code Conversion. (10)

C) Discuss about the following : (5)
i) Synchronous and Asynchronous Transmission
ii) Simplex and Duplex communication
iii) Serial and Parallel data transfer

6) Write ladder logic and digital circuit for the following expression. (6)

A)

$$Y = \bar{C}\left(\bar{A} + \left(\bar{A} + \left(\bar{B}\bar{C}\left(A + \overline{B\bar{C}}\right)\right)\right)\right)$$

B) Discuss about the following circuits: (6)

i) Set and reset
ii) Interlocking
iii) Latching circuit

C) Describe in detail the working of input and output module of a PLC? (8)

7) A) Elaborate on the different levels of Industrial Control Architecture? Where do the PLCs fit? (8)

B) Draw ladder logic for a pumping system that requires 5 s delay before pumping. When pump is shut off it requires 15 s delay before it can be restarted again. Draw timing Diagram and clamp (4)

C) Sketch and Explain: (8)

1. Sinking device with sourcing input module circuit.
2. Sourcing device with sinking input module circuit.
3. Sinking device with sourcing output module circuit.
4. Sourcing device with sinking output module circuit.

8) A) With timing diagram explain the working of On and off delay Timer. Also mention the data types of the timers. (6)

B) Explain different programing languages of PLC with Examples (6)

C) Describe in detail the seven layers of OSI. (8)

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