

<b>Name:</b>	
<b>Enrolment No:</b>	

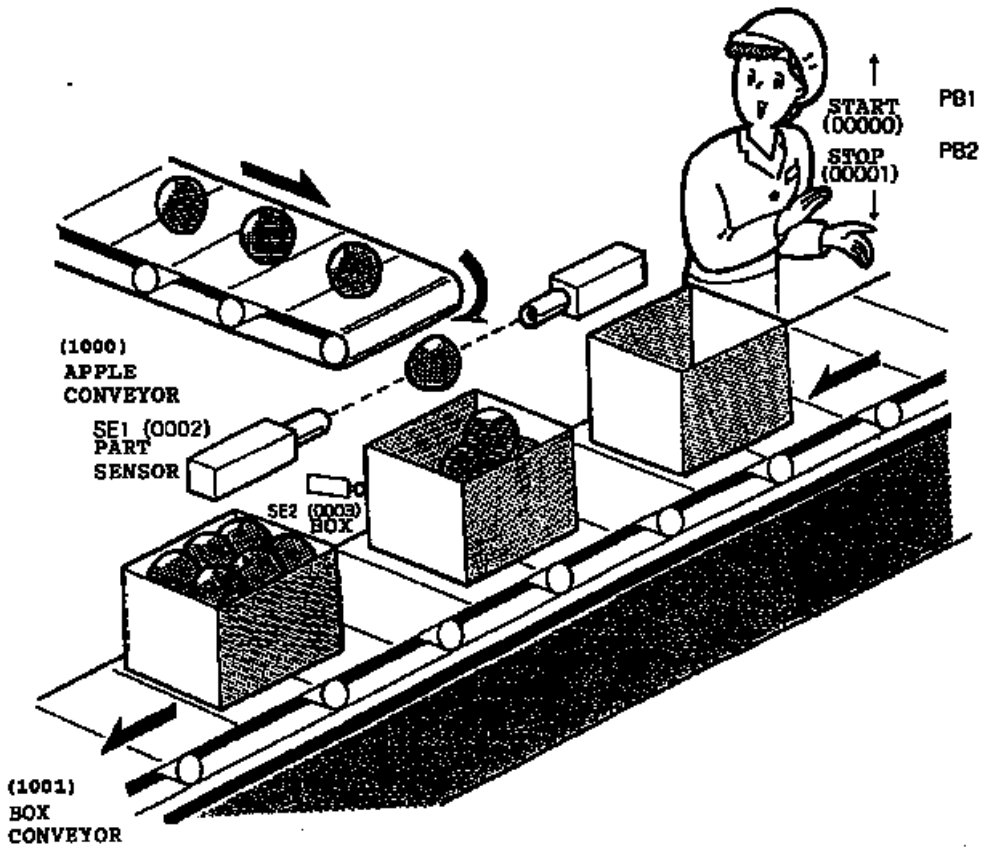
**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2018**

<b>Course: Telemetry and SCADA</b>	<b>Semester: III</b>
<b>Programme: M.Tech PLE</b>	
<b>Time: 03 hrs.</b>	<b>Max. Marks: 100</b>
<b>Instructions: All questions are compulsory.</b>	
<b>Assume, if data is unavailable.</b>	

**SECTION A**

S. No.		Marks	CO
Q 1	Fill in the blanks: <ol style="list-style-type: none"> <li>i. For connection of input –output devices to PLC ..... pair is used               <ol style="list-style-type: none"> <li>a. Sinking-sinking</li> <li>b. Sourcing-sourcing</li> <li>c. Sinking-sourcing or sourcing-sinking</li> <li>d. None of the above</li> </ol> </li> <li>ii. Maximum time delay provided by the timer.....               <ol style="list-style-type: none"> <li>a. 500s</li> <li>b. 16000s</li> <li>c. 32000s</li> <li>d. 32767s</li> </ol> </li> <li>iii. ....instructions are normally used in pairs and addressing with same bit.               <ol style="list-style-type: none"> <li>a. Latch and unlatch</li> <li>b. Examine if open and examine if closed</li> <li>c. One shot rising and one shot falling</li> <li>d. On delay timer and off delay timer</li> </ol> </li> <li>iv. If scan time of PLC small, the cost of PLC is .....               <ol style="list-style-type: none"> <li>a. More</li> <li>b. Less</li> <li>c. Moderate</li> <li>d. Does not depend on scan time</li> </ol> </li> <li>v. PLCs are designed not run on .....               <ol style="list-style-type: none"> <li>a. Load</li> <li>b. Power</li> <li>c. Force</li> <li>d. fault</li> </ol> </li> </ol>	<b>5</b>	<b>CO1,5</b>
Q 2	A process blower (P) is to run when following conditions are met: <ol style="list-style-type: none"> <li>i. Input A is off.</li> <li>ii. Input B is on or input C is on or both input B and C are on.</li> <li>iii. Input D and E are both on.</li> <li>iv. One or more inputs F. G and H are on.</li> </ol>	<b>5</b>	<b>CO1</b>

	Draw the digital gate circuit for it.		
Q 3	In reference to the previous question, draw the ladder diagram also.	5	CO1,2
Q 4	What is optocoupler and why it's been used in PLC's.	5	CO1
<b>SECTION B</b>			
Q 5	For a small scale pipeline network of not more than 50 Km. long is implementing SCADA fruitful, give reason?	10	CO,4
Q 6	Classify various SCADA failures. Also discuss its impact on industry operation.	10	CO,4
Q 7	A gas compressor station has 2 motor driven compressors. At any point of time one compressor works while other is standby. Both compressors have option to work in auto & manual mode. In auto mode they operate w.r.t. discharge pressure. They have individual electrical & mechanical safeties & emergency shutdown provision. Emergency shutdown can be released by a reset button only. Identify various inputs/outputs and classify them.	10	CO4, 5
Q 8	Discuss significant features of SCADA system, citing example.	10	CO4,5
<b>SECTION-C</b>			
Q 9	<p>In a gasoline distribution center each storage tank is connected to distribution lines via 3 pumps. (2-normal operation, 1-standby) In auto mode the selector logic configuration is:</p> <ul style="list-style-type: none"> <li>• 1 Running mode: the first pump available in the sequence will start.</li> <li>• 2 Running mode: the second available pump will start on receiving 'ADD 1 ON' command from the control room.</li> <li>• 3 Running mode: The third pump will start on receiving 'ADD 2 ON' from the control room.</li> </ul> <p>Based on the selector logic, the pumps can be stopped sequentially on receiving 'ADD 2 OFF' and 'ADD 1 OFF' command from the control room.</p> <p>The auto selector ensures that if any other pump is selected, the former pump selection shall be reset and the later shall be selected. Pump selection shall reset in any of the following conditions:</p> <ul style="list-style-type: none"> <li>• Any other pump selected.</li> <li>• Corresponding pump tripped (due to circuit breaker fault or process trip condition)</li> </ul> <p>Design a SCADA control philosophy for the above mentioned conditions. Also identify various analog and digital I/O's for the same.</p>	20	CO3,4
Q 10	In reference to figure shown below, when PB1 (START Push Button) is pressed, the box conveyor moves. Upon detection of box present, the box conveyor stopd and the apple conveyor starts. Part sensor will count for 10 apples. Apple conveyor stops and box conveyor starts again. Counter will be reset and operation repeats until PB2 (STOP Push Button) is pressed.	20	CO2,4, 5



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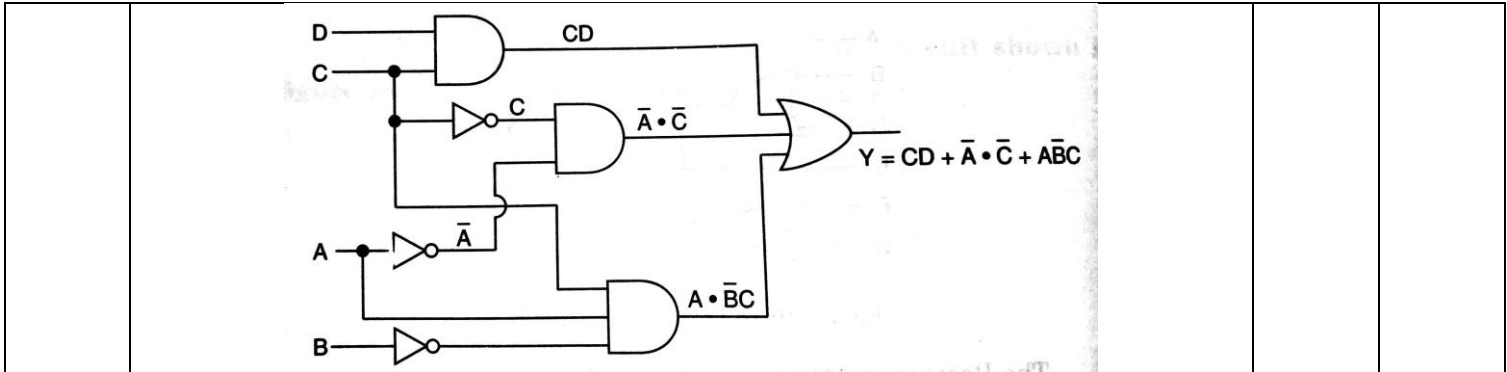
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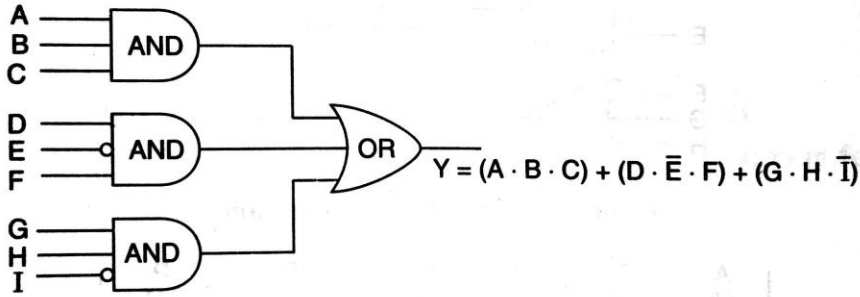
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**SECTION A**

S. No.		Marks	CO
Q 1	Explain with diagram sourcing and sinking connections.	4	CO2,5
Q 2	Fill in the blanks: i. .... requires practical analytical, logical skills. a. PLC wiring b. I/O modules c. PLC enclosures d. Troubleshooting ii. If all LEDs ie., status indicators of PLC are off. The fault lies with ..... a. I/O device b. Power supply c. Software of PLC d. I/O module iii. .... Is required to keep a track on rungs. a. Rung description b. Data tables c. Instruction symbol d. Program printout iv. .... are used to sense the position of objects or materials a. Flow switches b. Solenoids c. Limit switches d. Contactors v. .... is used to detect the presence or absence of an object without making any contact to it. a. Limit switch b. Proximity switch c. Temperature transmitter d. Level switch	5	CO1,2
Q 3	Convert the following digital gate circuit shown below into ladder logic:	5	CO1



Q 4 Convert the following digital gate circuit shown below into ladder logic:



**SECTION B**

Q 5	Implementation of an automation system is very expensive as it adds up a major amount to the installation cost, but it reduces the operation cost and hence is beneficial. Justify the statement.	10	CO5
Q 6	Cyber security is an integral part of SCADA system. Justify the statement.	10	CO5
Q 7	Discuss the architecture of SCADA system, citing example.	10	CO2,3
Q 8	Design the power circuit diagram and its corresponding ladder logic program for the reduced voltage starting of 3 phase induction motor.	10	CO1

**SECTION-C**

Q 9	Provide a case study of recent SCADA attack and possible remedies to avoid them.	20	CO3,4
Q 10	In reference to below figure, a simple car park control system that allows only a maximum of 100 cars parking space. Everytime a car comes in, the PLC will automatically add one through sensor S1. Any car that goes out will automatically be subtracted by one through sensor S2. When 100 cars are registered, the car park full sign will be lighted to inform oncoming vehicles not to enter.	20	CO3,4

CAR PARK  
FULL

(10000)

Car coming



S1 (0)

S2 (1)



Car coming out

