

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

V SEMESTER B.TECH. (MECHATRONICS ENGINEERING) END SEMESTER EXAMINATIONS, NOV 2017

SUBJECT: PROGRAMMABLE LOGIC CONTROLLER [MTE 3104]

(22/11/2017)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Data not provided may be suitably assume

1A.	Discuss about tuning of PID controller.	03
1 B.	Identify and discuss the potential benefits of CIM? (at least 8 points)	04
1C.	Write a program that will turn ON a light along with a timer, when a count reaches 20. This light is then to go OFF when the timer exceeds 35 seconds.	03
2A.	List and explain the main components of a typical DCS System architecture.	03
2B.	Construct the ladder logic program for a process, where the count will not start until 1 hour of the start of the process. After input of 100 counts, the output 'X' goes ON.	03
2C	Draw a typical PLC rack and discuss about its components.	04
3A.	Elaborate on various types of memory utilized for PLC. (At least 6 types)	03
3B.	With the ladder diagram indication, explain about R-TRIG and F-TRIG in PLC.	04
3C.	Simulate the EX-NOR and EX-OR gate using PLC ladder logic.	03
4A.	Describe the significance of network redundancy? Explain fully-redundant network.	05

4B. An industry will add a logo to the manufactured parts. These parts travel along 05 an assembly line via three stations (S1, S2 and S3) stations which takes 10s for the entire process.

S1: Sensor1 will detect parts arrived. After this, the 'clamp' output is turned ON for 10 seconds to hold the part during the whole operation.

S2: For the first 2 seconds (out of the entire 10 seconds), the part is being held for 'spray' and then, Sensor2 will be turned ON to apply the thermoset ink.

S3: For the last 8 seconds a 'heating operation' will be turned on to cure/dry the ink.

After this, the part is released and allowed to continue along the line.

(Note: after finishing the above process, if at all any part is found to be incomplete with respect to any of these 3 operation stations, that part should be re-operated at the required station only. Develop a ladder logic diagram for the entire process.

- 5A. Explain in brief about the types of Optical Fiber cable which is used for 02 transmission of data between devices.
- **5B.** Write a short note on the following:
 - (a) Remote terminal Unit (RTU)
 - (b) Self-healing ring network
- 5C. Construct a ladder logic diagram that will implement the following function. If the result is greater than 40 then an output light 'P' will be turned on. Assume A, B and C are inputs.

 $X = \ln[10 + A(B \sin^{-1}(4C + 5))^3]$

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04