Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent institution of MAHE, Manipal)

V SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, DEC 2018

SUBJECT: Programmable Logic Controller [MTE 3104]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Data not provided may be suitably assumed with justification
- Draw neat sketches and ladder diagrams with descriptions wherever required

1A.	Explain fully redundant network used in PLC based communication network.	**2**
1B.	Design a ladder diagram to generate square wave.	**3**
1C.	Name the three forms of PLC counter instructions, and explain the basic operation of each.	**5**
2A	Explain MCR instruction of PLC.	**2**
2B	Two feeder conveyors (F1 and F2) feed a part onto one main conveyor (M). A proximity device is at the end of each feeder conveyor. The proximity device outputs are fed as pulses to counters. Each counter then shows the count of parts being put onto the main conveyor. In addition, another proximity device at the end of the main conveyor in response to parts leaving and then sends the pulses to another counter. Develop a ladder program to show the total number of parts on the main conveyor at any point of time and if total number exceeds 100 then the feeder conveyors must remain off.	**5**
2C	Develop a Ladder diagram for an alarm system having 04 inputs and 03 outputs with following operation: If any two inputs are on, a red light goes on; If any three inputs are on, a siren sounds; If all four inputs are on, the fire alarm is generated.	**3**
3A	Express the following equation in ladder logic program: (i) $X = A + B(A + CB + DAC) + ABCD$ (ii) $F(a,b,c) = \Sigma(0,1,3,4,6,7)$	**4**
3B	Develop the ladder logic that will turn on a light, after switch A has been closed 10 times. Push button B will reset the counters.	**6**
4A	Describe PID function of PLC in detail.	**3**
4B	Explain functions of SCADA systems in brief.	**3**

4C	Design a ladder diagram to generate waveform with 60% duty cycle at digital output terminal when toggle switch is ON. The output frequency is 10Hz.	**4**
5A	Describe redundant PLCs. Explain different configuration with proper block diagrams.	**4**
5B	A pump is to be used to fill two storage tanks. The pump is manually started by the operator from a start/stop station. When the first tank is full, the control logic must be able to automatically stop flow to the first tank and direct flow to the second tank through the use of sensors and electric solenoid valves. When the second tank is full, the pump must shut down automatically. Indicator lamps are to be included to signal when each tank is full. Draw a sketch of the process and prepare a typical PLC program for this control process.	**6**