Reg.No.										

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

V SEMESTERB.TECH.(MECHATRONICS ENGINEERING)

END SEMESTER MAKE UPEXAMINATIONS, DEC 2019

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
- Follow the Allen Bradley instruction and notation.

1A.	Elaborate on Interposing relay connection with motor starter in PLC with required circuit sketch.	**04**	**CO2**
1B.	Define relays. List any four advantages that PLC offers over conventional Relay system.	**03**	**CO1**
1C.	Construct a ladder logic diagram that will implement the following function. If the result is greater than 100 then an output light 'P' will be turned on. Assume A, B and C are inputs. $$X = \ln[10 + A(B\cos^{-1}(4C + 5))^2]$$	**03**	**CO2**
2A.	Elaborate on types of Network Topologies.	**03**	**CO3**
2B.	Design a ladder logic program for the giving function. $$Y=(A\overline{BC}\oplus D) +(E\overline{DF})\,C$$	**03**	**CO1**
2C.	Explain the PID controller block for PLC and compare P, PI, and PID controllers with neat sketches.	**04**	**CO3**
3A.	Elucidate on the following circuits: • Set and reset • Interlocking • Latching circuit	**03**	**CO1**
3B.	Develop a ladder logic diagram for a new printing station that will add a logo to parts as they travel along an assembly line. When a part arrives, the part sensor will detect it. After this the 'clamp' output is turned on for 10 seconds to hold the part during the operation. For the first 2 seconds the part is being held a 'spray'	**04**	**CO2**

output will be turned on to apply the thermoset ink. For the last 8 seconds a 'heat' output will be turned on to cure the ink. After this the part is released and allowed to continue along the line.

3C. Sketch and explain the concept of sourcing and sinking with respect to the output module of a PLC. **03** **CO1**

4A. Design a ladder logic program for the following system as shown in fig 4a. **04** **CO2**
A conveyor with parts on it, is run by switching on or off a motor. The machine checks for the presence of parts through a part detection sensor, if part is present, the press arm stamps the part. Stamped parts are counted by the counter. If the counter value exceeds 30 count, a alarm should get ON for 5sec and restart the process again.

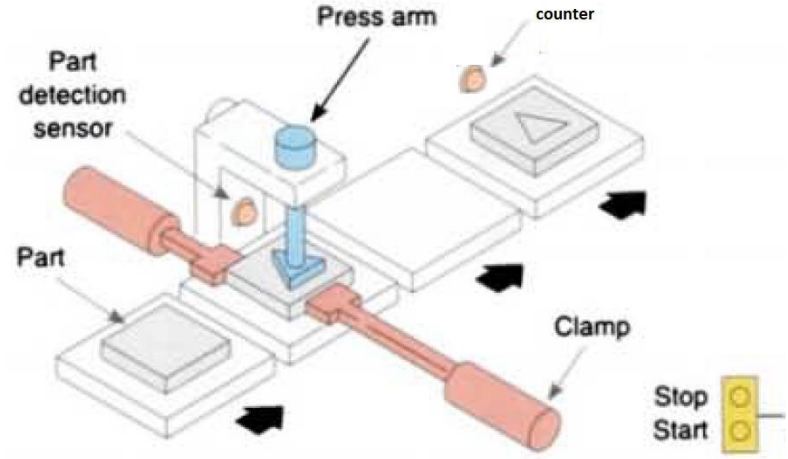

Figure 4a

4B. List the types of analog module available in PLC? **02** **CO3**

4C. Distinguish between RTU and MTU in SCADA system. **02** **CO3**

4D. State the communication levels used in PLC. **02** **CO3**

5A. Define and Explain the feature of the Distributed Control System. **04** **CO4**

5B. List any 6 differences between the PLC and SCADA system **03** **CO3**

5C. Arrange the layers of OSI model in sequence with required details. **03** **CO4**