MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. MAKEUP EXAMINATION

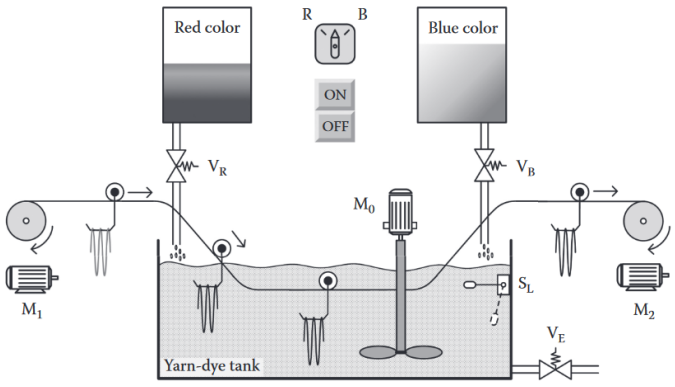
JULY 2024

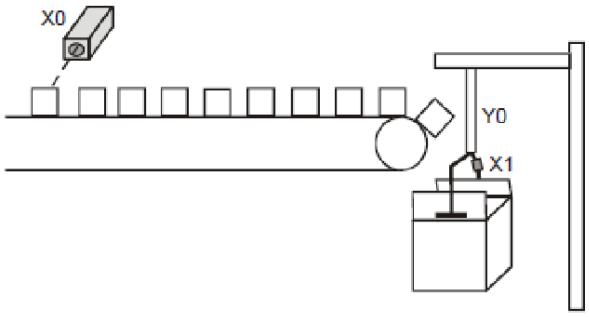
SUBJECT: INDUSTRIAL AUTOMATION [MTE 2223]

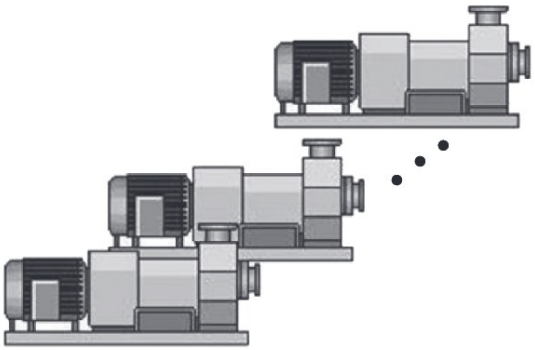
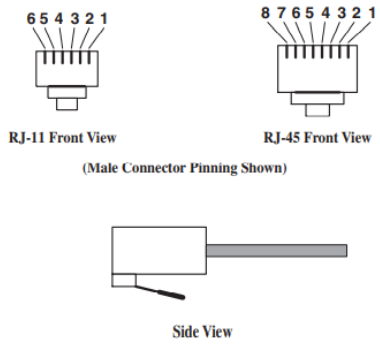
Date of Exam: **9/5/2024** Time of Exam: **02:30 PM – 05:30 PM** Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data may be suitably assumed

Q.NO.	QUESTION	M	CO	PO	LO	BL
1.	Distinguish between the various types of industrial automation in terms of product volume and product variety using a suitable diagram.	**2**	**1**	1, 2	1, 2, 3, 16, 18	**4**
2.	Categorize the growth of the industry in terms of the industrial revolutions using a suitable diagram to support your answer.	**3**	**1**	1, 2	1, 2, 3, 16, 18	**4**
3.	Examine the functioning of the batch drying process shown in the figure below. Deduce the working based on the automation components shown in the figure Q3.  Figure Q3	**5**	**1**	1, 2	1, 2, 3, 16, 18	**3, 4**
4.	Differentiate between the open loop and closed loop pneumatic systems using suitable illustrations and description.	**2**	**2**	1, 2, 3, 7	1, 2, 3, 16, 18	**4**

5.	Illustrate the construction and working of a Stepper motor using a suitable diagram and explanation.	**3**	**2**	1, 2, 3, 7	1, 2, 3, 16, 18	**4**
6.	Asses the construction and working of the following actuation and reset buttons of a pneumatic system. a.  b. 	**5**	**2**	1, 2, 3, 7	1, 2, 3, 16, 18	**5**
7.	State and describe the advantages of PLC programming.	**2**	**3**	1, 2, 3, 7	1, 2, 3, 16, 18	**4**
8.	Create a ladder diagram for the following operation of a product mass packaging system (Figure Q8) with specifications in Table Q8. Once the photoelectric sensor 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.  Figure Q8 Table Q8 Device | Function X0 | Photoelectric sensor for counting products. X0 = ON when products are detected. X1 | Robotic arm action completed sensor. X1 = ON when packing is completed. C0 | Counter: 16-bit counting up (general purpose) Y0 | Robotic arm for packing	**3**	**3**	1, 2, 3, 7	1, 2, 3, 16, 18	**6**

9.	In an industrial manufacturing process, there are typically many machines (motors), each of which may present one or more operating faults, the appearance of which is provided in the automation program, and causes either a simple indication or some other action. The figure Q9 below shows a series of pumps that may exist in a pump station, each of which may exhibit a fault, such as a thermal overload drop, a flow stop, etc. In the examined case, it is desired that for any of the apparent fault triggers, a corresponding indication remains active (on) for as long as the fault lasts, while simultaneously triggering a corresponding logic coil momentary for one scan cycle.  Figure Q9 Create a ladder diagram for the above operation.	**5**	**3**	1, 2, 3, 7	1, 2, 3, 16, 18	**6**
10.	Illustrate the various topologies of computer networks with their pros and cons.	**2**	**4**	1, 2, 3, 7	1, 2, 3, 16, 18	**4**
11.	Deduce how many subnets and hosts per subnet can you get from the network 192.168.210.0 255.255.255.224.	**3**	**4**	1, 2, 3, 7	1, 2, 3, 16, 18	**4**
12.	Identify the connectors shown in the Figure Q12 below and cite their uses.  Figure Q12	**5**	**4**	1, 2, 3, 7	1, 2, 3, 16, 18	**4**

13.	Discuss the operation of the Foundation Fieldbus H1 communication protocol in detail with suitable diagrams with reference to its wiring and application.	**2**	**5**	1, 2, 3, 7, 12	1, 2, 3, 5, 16, 18	**4**
14.	Discuss the architecture of a SCADA system with a suitable illustration.	**3**	**5**	1, 2, 3, 7, 12	1, 2, 3, 5, 16, 18	**4**
15.	Create a LAD diagram, state diagram and HMI diagram for the following operation. Consider the case of a machine that contains two direct on line starting motors being supplied by power through the relays C1 and C2 . The first motor (C1) is being controlled manually through the utilization of two pushbuttons, b0 for STOP and b1 for START. The second motor (C2) is being controlled from a sensor s. The operation of one motor should exclude the operation of the other one.	**5**	**5**	1, 2, 3, 7, 12	1, 2, 3, 5, 16, 18	**6**