MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M. TECH (Industrial Automation and Robotics)

END SEMESTER EXAMINATIONS, 25 JUNE 2022

SUBJECT: **Fluid Power Systems and Factory Automation** [MTE 5252]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A.	Sketch and explain the working of bent axis piston pump and compare its characteristics with gear pump which are used in hydraulic control system.	**4**	C01	P02	Understand
1B	An 8 cm diameter hydraulic cylinder has a 4 cm diameter rod and the cylinder receives oil flow at 100 LPM and system pressure is maintained at 12 MPa. Find the (a) extension and retraction speeds and (b) extension and retraction load carrying capacities of the hydraulic cylinder by neglecting flow losses.	**2**	C01	PO5, PO9, PO10	Apply
1C	What is the purpose of accumulator? With the help of sketch describe the working of weight loaded accumulator along with its application circuit.	**4**	C01	P02	Understand
2A.	With suitable circuit discuss how meter-in and meter-out methods are adopted for controlling the speed of hydraulic cylinder for extension and retraction strokes.	**4**	C02	PO5, PO9, PO10	Apply
2B.	Explain the concept of air cushioning in pneumatic cylinder.	**2**	C02	P02	Understand
2C	Using a suitable hydraulic control valve, explain how free-falling of the cylinder can be controlled while the load moves in vertically downward direction. (Write circuit)	**4**	C02	PO5, PO9, PO10	Apply
3A.	With the help of neat sketch explain the working of electrically actuated 5/2 direction control valve	**3**	C05	P02	Understand
3B.	Write the symbols for following devices **a)** *Proportional flow control valve* **b)** *5/3 double solenoid with neutral position having all ports closed* **c)** *Capacitive proximity sensor* **d)** *Unloading hydraulic valve*	**2**	C05	P02	Remember

3C	List out the commonly used electrical devices in fluid power systems.	2	CO3	2	Remember
3D	Sketch the equivalent pneumatic and electric logic analog for boolean expression. $Q = \overline{A+B}$ and $Q = \overline{A}\,\overline{B}$	3	CO3	2,3,4	Apply
4A	Mention the importance of manual and automatic control of double-acting cylinder	2	CO3	1,2	Understand
4B	Draw the cascading system of a two-cylinder unit which has the sequence of group1 A+B+ and group2 B- A- Note: Use Appropriate pneumatic and electronics components	3	CO3	2,3,4	Apply
4C	In a press shop, the stamping operation is to be performed using a stamping machine. Before stamping, the workpiece has to be clamped under the stamping station. Then the stamping tool comes and performs the stamping operation. The workpiece must be unclamped only after the stamping operation. Write down the sequence, draw the motion diagrams and sketch the control circuit using appropriate pneumatic components.	4	CO3	1,2,3,4	Analyze
4D	What is the importance of the PLC controller in the hydraulic and pneumatic system?	1	CO5	1,2	Understand
5A	Mention the critical feature of the servo valve.	2	CO4	1,2	Remember
5B	Draw the closed-loop hydraulic control system with proper fluid power elements.	3	CO4	1,2	Analyze
5C	Illustrate the pneumatic circuit, PLC wiring diagram, and ladder diagram to implement the task of the double-acting cylinder is used to perform forward and return automatically after reaching the extreme-forward position. The pneumatic cylinder is advanced by pressing push buttons PB1.	4	CO3	1,2,3,4	Analyze
5D	List out the types of valves used in hydraulic/pneumatic control technology.	1	CO5	1,2	Understand