Reg. No.										

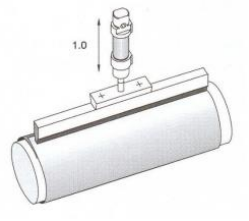
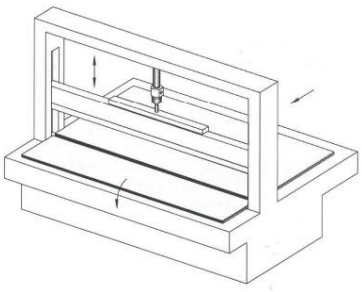
MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

DEPARTMENT OF MECHATRONICS
II SEMESTER M.TECH. (Industrial Automation and Robotics)
END SEMESTER EXAMINATIONS, DECEMBER 2023
SUBJECT: FLUID POWER SYSTEMS [MTE 5115]
(Date: 9/12/2023)

Time: 3 Hours **MAX. MARKS: 50**

Instructions for the Candidates:
- Answer **ALL** questions.
- Data did not provide any, may be suitably assumed.

Q. No		M	CO	PO	LO	BL
1A	Compare the hydraulic & pneumatic control system with 8 different factors	**4**	1	2,4	1,2,5	4
1B	Explain the working of air lubricator with the help of neat diagram	**3**	1	1,2	1,2	2
1C	Describe the working of optical sensor used for position sensing	**3**	1	1,2	1,2	2
2A	Illustrate the working of counter balance valve	**4**	2	1,2	1,2	2
2B	Describe the working of vane pump with neat diagram	**3**	2	1,2	1,2	2
2C	Develop the hydraulic circuit for illustrating the use of accumulator as an auxiliary power source for completing the cycle of operation	**3**	2	1,2	1,2,5	4
3A	Describe the working of electrical type limit switch with neat diagram	**3**	2	1,2	1,2	2
3B	Apply the cascade method for elimination of signal overlap for obtaining the sequence A+B+B-A- in pneumatic control system	**4**	3	1,2	1,2,5	4
3C	The double acting hydraulic cylinder has to extend rapidly for stamping application in the sheet metal industry. The cylinder has to return automatically after stamping. Using regenerative fluid method, design the electro-hydraulic circuit. Make suitable assumptions for the controls.	**3**	3	2,4	1,2,5	4
4A	An electrically heated welding rail is pressed onto a rotatable cold drum by a double acting cylinder and welds a continuous plastic sheet into pieces of tubing. The forward stroke is triggered by means of a push button. The maximum cylinder force is set at 5 bar via a pressure regulator with pressure gauge to prevent the welding rail damaging the metal drum. The return stroke is not initiated until the forward end position has been acknowledged and the pressure in the piston area has reached 3 bar. The supply air is restricted for the movement of the cylinder. Restarting is only possible when the retracted end position has been reached and a time of t = 2 seconds	**4**	3	2,4	1,2,5	4

	has elapsed. Reversing a 5/2 way valve with selector switch causes the control to be switched to continuous cycle. Design the pneumatic control system for this application.  Fig. 4A Heating drum					
4B	Using a cutting device sheets of paper are to be cut to size. By pressing two push button switches the cutting blade is advanced and the sheet of paper is cut. After releasing one pushbutton switch the cutting blade is returned to its start position. Design the electro-pneumatic control circuit for this application in the paper industry.  Fig. 4B Paper Cutting Machine	**3**	3	2,4	1,2,5	4
4C	Design the electro-hydraulic circuit to regulate the cylinder speed through meter out/exhaust throttling flow regulation during the return movement of double acting cylinder.	**3**	3	2,4	1,2,5	4
5A	Describe the construction and working of unloading valve and also design the hydraulic circuit to demonstrate the use of this valve for unloading the fluid flow from high flow and low pressure pump when the dual pumps (the high flow and low pressure pump, the low flow and high pressure pump) are used in the hydraulic circuit.	**4**	4	2,4	1,2,5	3
5B	Compare the proportional valves with traditional direction control valves	**3**	4	2,4	1,2,5	3
5C	A cylinder with a bore diameter of 50 mm and a rod diameter of 20 mm is to be used in a system with a maximum pressure of 15,000 kPa. Determine the maximum extension and retraction forces? For this system, what effect would be doubling the bore diameter have on the output force generated on extension?	**3**	5	1,2	1,2,5	3