Reg. No.										

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

DEPARTMENT OF MECHATRONICS

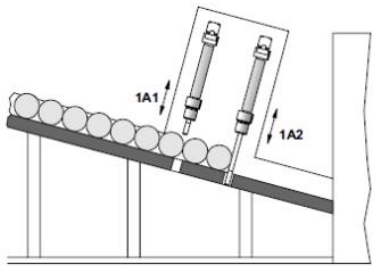
II Semester M.TECH. (IAR) End Semester Examinations May-2023

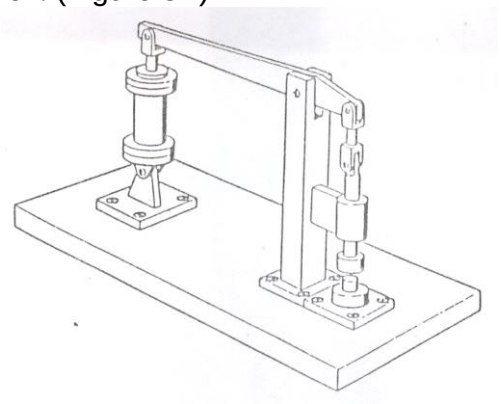
MTE 5252: FLUID POWER SYSTEMS AND FACTORY AUTOMATION

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

Instructions to Candidates:

- Answer **ALL** the questions.
- Data not provided may be suitably assumed

Q. No		M	CO	PO	LO	BL
1A.	Turned parts for a spark plug are fed in pairs on a rail to a multi-spindle machining station. In order to achieve separation, two double acting cylinders are triggered by one actuator in alternating push-pull rhythm. In the initial position, the upper arm cylinder 1A1 is retracted, the lower cylinder 1A2 in the forward position. Turned parts are resting against the second cylinder 1A2. A starting signal causes cylinder 1A1 to advance and the cylinder 1A2 to retract. The blanks of two spark plug roll onto the machining station. After an adjustable time of t_1=1 sec, cylinder 1A1 returns and cylinder 1A2 advances at the same time. A further cycle can be started only when time interval t_2=2 sec has elapsed. The circuit is switched on by means of a push button valve and a detent valve makes it possible to change over from single to continuous cycle. Design the suitable pneumatic circuit for this application (Figure 1A)  Figure 1A	**5**	**3**	**1,3**	**1,3**	**6**
1B.	Describe the working of pneumatic time delay valve with the help of neat sketch and compare the difference between NO/NC timers	**5**	**1,3**	**1,2,3**	**1,2,3**	**2**
2A.	Explain the working of gas loaded accumulator and demonstrate its application for leakage compensation of the hydraulic oil.	**5**	**2,3**	**1,2,3**	**1,2,3**	**2**
2B	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**	**3**
2C	Discuss the construction and working of telescopic hydraulic actuator	**2**	**2**	**1,3**	**1,3**	**2**

3A	Describe the working of Pressure to electric converter (PE) used in pneumatic applications	**4**	**4**	**1,3**	**1,3**	**2**
3B	Badges are to be produced from a very thin metal sheet. A press with a stamping die is available for this purpose. The double acting cylinder should extend when both the push buttons S1 and S2 are pressed simultaneously. To get the consistent quality, the return stroke is to occur automatically only after the forward end position, preset pressure and elapsed time of 3 seconds. The cylinder should immediately retract if emergency push button E is pressed. (use of pneumatic or electro pneumatic components is permitted). Design the electro-pneumatic control circuit for this application. (Figure 3B)  (Figure 3B)	**4**	**3,4**	**1,2,3**	**1,2,3**	**6**
3C	Design an electro-hydraulic circuit to regulate the cylinder speed through bleed off flow regulation during forward movement of double acting cylinder.	**2**	**3,4**	**1,2,3**	**1,2,3**	**2**
4A.	A process sensitive operation needs a pneumatic circuit to carry out following operation A+ B+, B- A-. Design the manual pneumatic circuit to handle the signal conflict by using cascade valve.	**4**	**3**	**1,2,3**	**1,2,3**	**6**
4B.	Describe the working of pressure compensated flow control valve	**3**	**2**	**1,3**	**1,3**	**3**
4C.	Compare the conventional and proportional hydraulic valves.	**3**	**2,4**	**1,3**	**1,3**	**3**
5A.	Design an electro hydraulic control circuit for clamp and bend application using pressure sequence valve	**4**	**4**	**1,3**	**1,3**	**3**
5B.	In a coin embossing machine, the double acting cylinder has to extend to ¾ th of its stroke rapidly and thereafter creep till its end position. Develop a electro hydraulic circuit to carry out this operation and explain its working.	**3**	**3**	**1,2,3**	**1,2,3**	**3**
5C.	Explain the working of relay and design the dominant-off latching for controlling the single acting pneumatic cylinder	**3**	**4**	**1,3**	**1,3**	**3**