Exam Date & Time: 09-Dec-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL
DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
VII SEMESTER B.TECH. (MECHANICAL)
END SEMESTER EXAMINATION- NOV-DEC 2023

Fluid Drives and Controls [MME 4068]

Marks: 50 **Duration: 180 mins.**

Descriptive

Answer all the questions.

1A)	Analyse the following industrial application and develop the manual pneumatic application circuit. Surveyor's measuring rods in 3 or 5 m length are marked in red with 200 mm graduations. There is a choice of two push buttons to start the forward movement of measuring rods via cylinder, which has the exhaust air throttled. The idle stroke, also started by a push button, can only take place when the double acting cylinder has reached its forward end position.	(5)
1B)	Explain the structure of pneumatic control system with block diagram and symbols.	(3)
1C)	Describe the working of an air compressor that can be categorised into positive displacement device where high pressures (> 20 bar) and relatively low volumes (< 10,000 m3/hr) are needed.	(2)
2A)	Analyse the following industrial application and develop the manual pneumatic application circuit. A double acting cylinder guides cylinder pins towards a measuring device. The pins are separated by means of a continuous to and fro movement. The oscillating motion can be started by means of a valve with selector switch. The duration of forward stroke and return stroke of the cylinder is to be adjustable. The cylinder is to remain in the forward end position for t = 5 seconds.	(5)
2B)	Many pneumatic system components and almost all pneumatic tools perform better when lubricated with oil. Explain with sketch, the mechanism to achieve it.	(3)
2C)	Describe with sketch the mechanism especially helpful when the pneumatic piston rod is connected to a heavy load and the piston is at a high speed.	(2)
3A)	Deduce the working principle of three different types of optical proximity switches used in electropneumatic applications.	(3)
3B)	A magnetic and a plastic component must be detected on the conveyor belt. Suggest and explain the working principle two types of noncontacts switching without an external mechanical actuating force.	(3)
3C)	Analyse the following industrial application and develop the electropneumatic application circuit. A station is to be used to check whether the lids of cans are present. If a can without a lid is encountered, this must be pushed one side by a pneumatic cylinder. The lids and cans are interrogated by means of sensors.	(4)
4A)	Analyse the following industrial application and develop the electropneumatic application circuit using a double acting cylinder. A pneumatic cylinder is used to stamp	(5)

a notch in the work piece. The stamping operation must be initiated when two of three signal generators are activated. The signal components a, b and c are fitted to provide sensing functions. When the work piece is removed from the device, the cylinder returns to its rearmost end position.

4B)	To pump the fluid in a hydraulic system, suggest a suitable positive displacement pump whose parts are non-reciprocating and move at constant speed.	(3)
4C)	Briefly describe four important functions served by the reservoir (also called tank) in the hydraulic system.	(2)
5A)	In a spot-welding setup, the clamp actuator must be extended first, and as soon as the workpiece is clamped, the spot-weld head actuator must extend. Both actuators are permitted to retract simultaneously. Suggest a suitable hydraulic pressure control valve and explain its working principle.	(4)
5B)	Explain the working principle of direct acting PRV, the pressure at which the valve starts to divert flow to tank is called "cracking pressure".	(3)
5C)	Give details about the working principle of DCVs having different variety of center configurations which controls the actuation of hydraulic actuators having Three positions, four ways.	(3)

-----End-----