Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: HYDRAULICS AND PNEUMATICS [MME 334]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

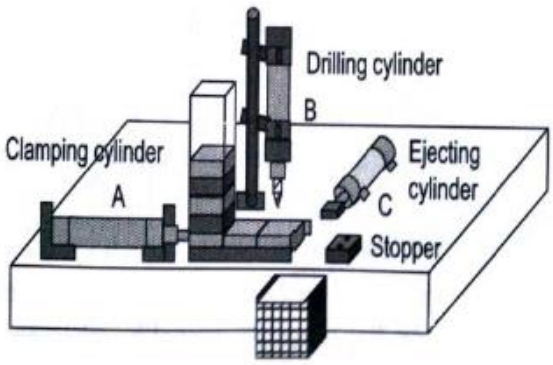
- Answer **ANY FIVE FULL q**uestions.
- Missing data may be suitably assumed.
- Relevant neat sketches have to be drawn where ever necessary.

1A. Enumerating the common parts, explain the construction of a hydraulic reservoir with a neat sketch. **3**

1B. Describe the operation of a pilot-operated solenoid DCV. What is the advantage of these valves over the simple solenoid type? **4**

1C. Draw pneumatic circuit to carry out following operation. Use Idle return Roller lever valve to eliminate signal overlapping A+, B+, B-, A- **3**

2A. Rectangular shaped workpieces are drilled using a pneumatically controlled drilling machine as shown in the fig. The workpieces are arranged in a gravity feed magazine. These workpieces are pushed and clamped by means of clamping cylinder A, drilled by drilling cylinder B and ejected by ejecting cylinder C. Draw the displacement step diagram and develop an electro pneumatic control circuit to implement the given control task. **5**



2B. How does an external gear pump differ from an internal gear pump? What types of gears are generally used in gear pumps? State them. **3**

2C. What is the purpose of a pressure-reducing valve? Describe its operation with proper circuit. **2**

3A. Design a manual pneumatic circuit for a double acting cylinder to perform a continuous to and fro motion. The cylinder has to stop automatically after performing 50 cycles of operations. **4**

3B. Explain with neat sketches the working principle of an electromagnetic relay. **3**

3C. Draw and explain a hydraulic motor with meter-out flow control of both directions of rotation. **3**

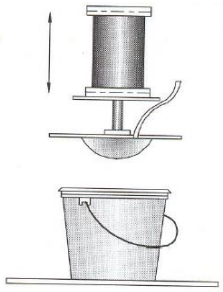
4A. Double acting cylinder is to be controlled using 5/2 directional control valve, single solenoid, spring return. When push button PB1 is pressed, cylinder should extend and remains in that position when PB1 is released. The cylinder is to retract completely when PB2 is pressed. In addition, the cylinder is to remain in the retracted position even when PB2 is released. Develop an electro-pneumatic control circuit with an electrical latching with dominant ON. **4**

4B. Clarify the working and application of a “regenerative neutral”. **3**

4C. Mention the use, advantages and disadvantages of the different forms of location of the filter in a hydraulic system. **3**

5A. Enumerate the differences between spool valve and poppet valve. Compare positive and negative overlap spool valve. **3**

5B. Using a lid lifting device snap on lids is to be pressed onto plastic buckets. By pressing push button switch the domed press is advanced & the snap - on lid is pressed on. Once the fully advanced position is reached, the cylinder is to remain for a time of T= 6 seconds and then immediately retract to the initial position. The cylinder retraction is to be adjustable. A new start cycle is only possible after the cylinder has fully retracted. Draw a manual pneumatic circuit for the function of this. **3**



5C. With neat sketch explain the working principle of inductive and optical sensors. **4**

6A. Describe the construction of a tandem cylinder. What is its advantage over a standard cylinder? Are there any disadvantages? **2**

6B. In a press shop, stamping operation is to be performed using a stamping machine. Before stamping, work piece has to be clamped under stamping station. Then stamping tool comes and performs stamping operation. Work piece must be unclamped only after stamping operation. Draw the displacement step diagram and develop a pneumatic circuit by using group changing cascading method. **5**

6C. Name a type of flow control valve used in fixed displacement pump circuit to reduce the energy consumption compare to other types of FCV. Explain its working principle with a sketch. State its disadvantage **3**