Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

II SEMESTER M.TECH. (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: FLUID POWER SYSTEM AND FACTORY AUTOMATION

[MTE 5201]

(17/04/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Data not provided may be suitably assumed with justification.
- Use ISO symbols to draw circuits.

1A With sketch explain the construction and working of variable displacement vane pump. **04**

1B Identify the factors which will cause cavitation and also explain the rules to control cavitation. **03**

1C Differentiate between spool and poppet type direction control valves. **03**

2A With sketch explain the construction and working of mechanical servo valve. **03**

2B M/S. Srinivas Pvt. Ltd. company is one of the leading company in manufacturing of deep drawing machine. They are using two different capacity pumps to address two different required system pressure conditions. Suggest the type of proportional control valve which would eliminate the one of the pump and satisfies the two different system pressure conditions. With sketch explain and justify your answer. **04**

2C Explain the working of pressure unloading valve with a suitable application. Draw hydraulic circuit for the application. **03**

3A Design and draw the working of pneumatic circuit using KV method for controlling of the sequence as shown in traverse-time diagram (Figure Q 3A). Where A+, B+ stands for cylinder extension and A-, B- represents retraction of the cylinder. **05**

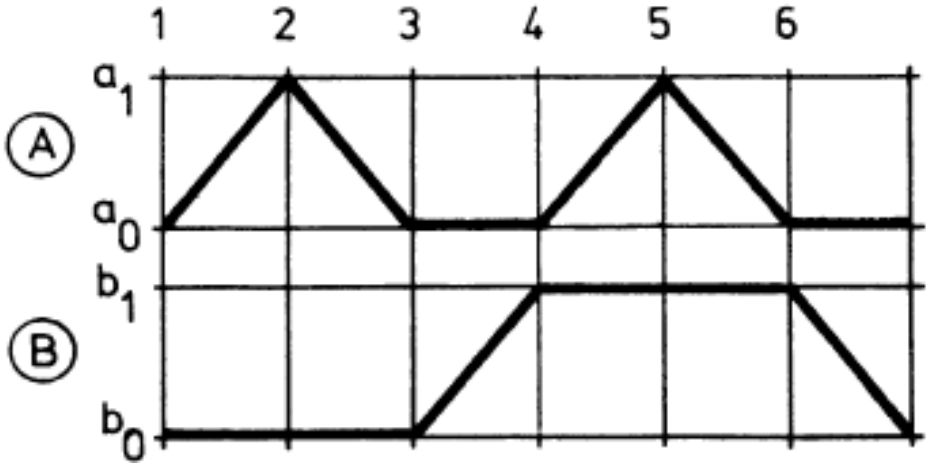

Figure Q 3A Traverse time diagram

3B Demonstrate different types of power transmitting medium used in fluid power system for Industrial automation. **2**

3C M/S. Precihole machine tool Pvt. Ltd. company is manufacturing deep hole drilling machine. So far, electric motor with linear motion guide ways is used for feeding the tool. The company found that higher force is required for drilling deep hole. Hence, they selected a bent axis piston pump to achieve the required force. Compare different types of actuation systems (only electrical) used in direction control valves and suggest the best suited one. **3**

4A Under make in India scheme, M/s. Hydrotronics company has got an order to develop embossing machine. The operations of embossing machine is feeding, clamping, embossing and ejecting of work piece. The work piece is taken from the gravity feed magazine and placed into the machine table by actuating the cylinder 1. Cylinder 2 is used to clamp the work piece. **05**

Cylinder 3 is used to carry out the embossing operation. The embossing time is adjustable via a timer. Cylinder 4 is used to eject the work piece. Develop an electro-hydraulic control circuit for the sequence of A-, A+, B+, C+, delay of 10sec, C-, B-, D+, D- and also draw its traverse–time diagram to implement the control task.

4B Develop a pneumatic circuit for the material handling operation using step counter method and draw displacement-stage diagram. The sequence of material handling operations are represented by A+, B+, B-, C+, C- A-. Where A+,B+,C+ represents extension of the cylinder and A-,B-,C- represents retraction of the cylinder. **05**

5A Design a control circuit and explain the working of closed loop speed control system of hydraulic motor. **04**

5B Explain the different types of regulators used to control the proportional control valve. **03**

5C A torque motor is connected in a push–pull circuit. Each coil has a resistance of 40 Ω and is rated at 300 mA. Calculate: **03**

(a) The voltage of each coil when the armature is centered.

(b) The maximum value of ΔI (ΔI=change in current).

(c) The maximum control power for the torque motor.