Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.TECH (INDUSTRIAL AUTOMATION AND ROBOTICS)

END SEMESTER EXAMINATIONS, APRIL 2017

SUBJECT: FLUID POWER SYSTEMS AND FACTORY AUTOMATION

[MTE 5201]. Date: 20.4.17

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL q**uestions.
- Data not provided, may be assumed suitably.

1A.	Discuss the situations where hydraulic motors are preferred over electric motors, and the construction and working of a radial piston pump.	**5**
1B.	The clamping and stamping cylinders named as A and B respectively have to be operated as per the given sequence A+B+B-A- .Where A+ and B+, represents extension of the cylinder and A-and B- represents retraction of the cylinder. Develop the pneumatic circuit for the same. Use cascading method to avoid the signal conflict.	**5**
2A.	Enumerate the differences between spool valve and poppet valve	**2**
2B.	A double-acting cylinder is used to press together glued components. Upon operation of a push button, the clamping cylinder extends. Once the fully advanced position is reached, the cylinder is to remain in the extended position till the preset pressure of 4 bar is reached 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.	**5**
2C.	The pressure rating of the components in a hydraulic system is 10^5 kPa. The system contains a hydraulic motor to turn a 0.3 m radius drum at 30 RPM to lift a weight of load 4000 N as shown in Figure 2c Determine the flow rate and brake power if the motor efficiency is 90%.	**3**
3A.	An accumulator is to be used as a compensator for internal and external leakage during an extended period in which the system is pressurized but not in operation.	**3**

	Develop the hydraulic circuit for the same.	
3B.	Design an electro-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	**3**
3C.	Sketch and explain the working of a quick exhaust valve along with its application.	**4**
4A.	A hydraulic system contains a pump discharging oil at 13.8 MPa and 0.00632 m^3/s to a hydraulic motor as shown in Figure. 4A. The pressure at the motor inlet is 12.40 MPa due to pressure drop in the line. If oil leaves the motor at 1.38 MPa, determine the power delivery by the 100% efficient motor. (a) What torque would a hydraulic motor deliver at a speed of 1750 RPM if it produces 3 kW? (b) If the pressure remains constant at 13.8 MPa, (i) what would be the effect of doubling the speed on the torque and (ii) what would be the effect of halving the speed on the torque?	**4**
4B.	Draw with sketch how end cushioning arrangement is implemented in air cylinders.	**3**
4C.	Explain the working of a pilot check valve with remote sensing.	**3**
5A.	Enumerate the common parts and explain the construction of a hydraulic reservoir.	**4**
5B.	The arrangement for an automatically operated Electro-pneumatic lathe is shown in figure 5B. Cylinder 1 shifts the entire feed magazine to the transfer station. Cylinder 2 pushes the work-piece into the lathe chuck. Cylinder 1 and 2 then retract. Cylinder 3 moves the slide rest forward and back. Cylinder 4 ten ejects the work-piece following the release of the lathe chuck. The sequence of operations of these cylinder is shown in displacement and step diagram. Develop a Electro-pneumatic control circuit to implement the control task.	**6**
6A.	With a relevant hydraulic circuit explain how to raise and lower a large weight using a four-way DCV. Draw a circuit to show the application of the servo valve to control the speed of hydraulic motor operating a winch, to a very precise tolerance.	
6B.	Write a Structure of group-changing relay circuit for two groups.	**3**
6C.	Discuss three configurations of connecting the coils of the torque motor.	**3**

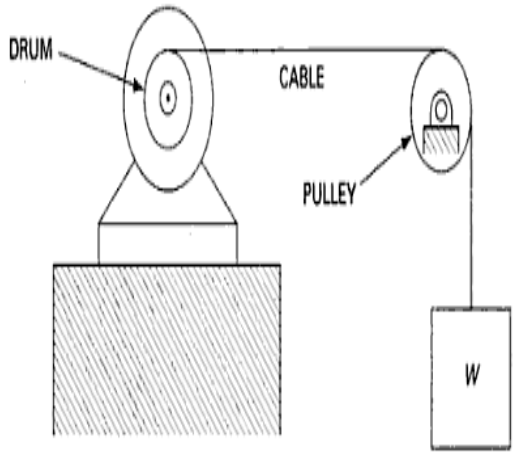

Figure 2c.

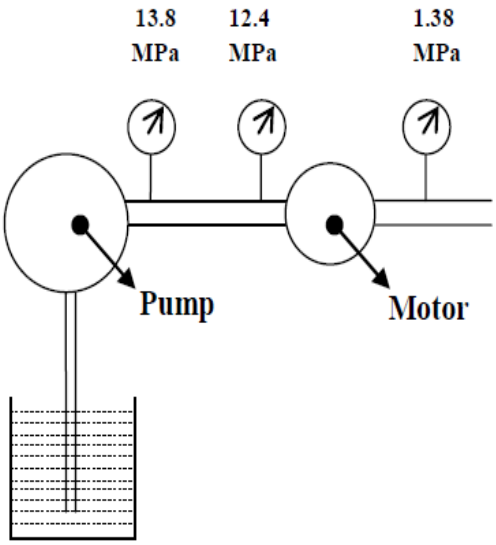

Figure 4A

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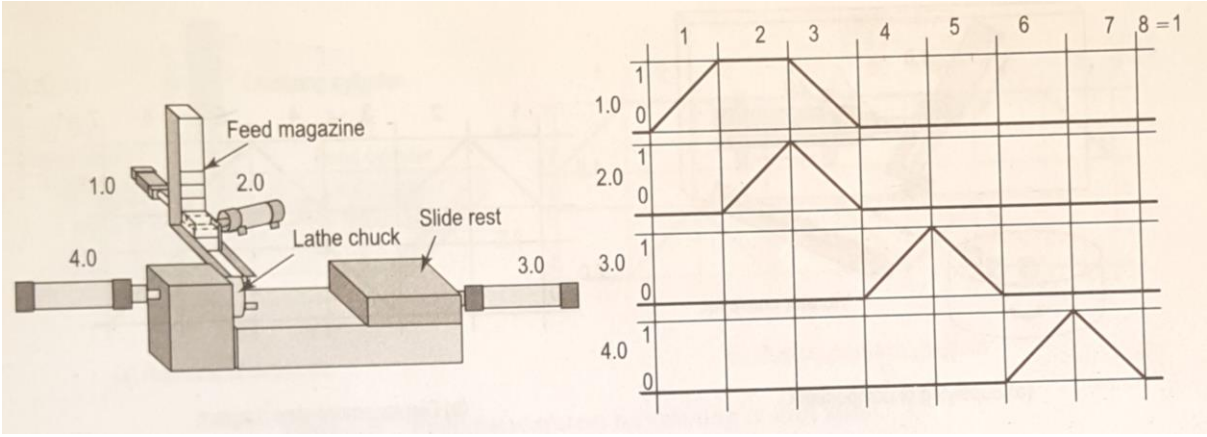

Figure 5B