GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. Sem-VI Examination May 2011
Subject code: 162004
Subject Name: Hydraulics and Pneumatic systems

Date:21/05/2011   Time: 10.30 am – 01.00 pm
                                             Total Marks: 70

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	(i) State the basic advantages of hydraulic system over mechanical system.	04
		(ii) Describe briefly about Biodegradable oils.	03
	(b)	(i) Explain briefly the following fire resistant fluids:	04
		1)Water-in-oil Emulsion	
		2) Phosphate Esters	
		(iii) State the Pascal's law. Explain the principle of Bramah's press.	03

Q.2	**(a)**	(i) Which different types of the valves are used in oil hydraulic systems? State their functions. Give specifications of a direction control valve.	04
		(ii) Differentiate between a Positive displacement pump and Rotodynamic pump. Give three examples of each.	03
	(b)	(i) Describe briefly variable displacement vane pump.	04
		(ii) How does an external gear pump differ from an internal gear pump? What types of gears are used in the pump?	03

OR

	(b)	(i) Describe bent axis type Axial Piston Pump.	04
		(ii) Differentiate between a seat type and spool type DC valve. Which of these two types of valves are widely used? Why?	03

Q.3	**(a)**	(i) Differentiate the functions and characteristics of close centre valve and tandem centre valve with neat sketch.	04
		(ii) Why two stage electro-hydraulic valve is preferred over single stage valve? State the function of pilot stage in it.	03
	(b)	(i) Explain why and where filters are fitted to a hydraulic system.	04
		(ii) Explain working of a regulator used in a pneumatic circuit.	03

OR

Q.3	**(a)**	(i) A pump supplies oil at 1.6 liters/sec to a 40 mm diameter double acting hydraulic cylinder. If the load is 5000 N (Extending and retracting) and rod diameter is 20 mm, find the hydraulic pressure, piston velocity and cylinder power (kW) during the extending stroke and retracting stroke.	04
		(ii) Explain only Lubricator of FRL unit in pneumatics.	03
	(b)	(i) Give four distinct applications of pneumatic system.	04
		(ii) What is loop system in piping layout?	03

Q.4	**(a)**	(i) Sketch the typical fluid reservoir and name the parts, giving their function.	03
		(ii) Give different methods to control speed of a cylinder. Explain one in detail.	02

(iii) In Bramah's press (Fig.1) F_1 = 40 kN, D_1 = 100 mm, S_1 = 50 mm, D_2 = 150 mm find F2 and S2. **02**

(b) (i) Design and explain operation of, **04**
1) Failsafe circuit with overload protection.
2) Pressure intensifier circuit.

(ii) Calculate the heat loss in a pumping system, delivering 40 litres/min oil at 160 bar, the pump efficiency being 65%. **03**

OR

Q.4 **(a)** (i) State different types of Accumulator. Explain one in detail. **03**
(ii) What type of gas is used in gas charged Accumulator? Why oxygen is not used? **02**
(iii) State the factors affecting selection of a hose pipe. **02**
(b) (i) Draw the double acting hydraulic cylinder and name different parts. **03**
(ii) What do you understand by cushioning in hydraulic cylinder? **02**
(iii) What are different sources of heat generation and what is the effect of heat generated in hydraulic system? **02**

Q.5 **(a)** (i) A pneumatic strip feed mechanism is to be designed with the following sequence. **04**
1. Holding the strip
2. Moving the strip forward onto the tool
3. Maintaining the strip in that position.
4. Returning the feeding element to its original position after the work is over.
Draw the pneumatic circuit by intuitive method.
Position step diagram is given in Fig.2
(ii) Explain construction and operation of time delay valve. Illustrate its application in setting delay in closing time through a typical pneumatic circuit. **03**
(iii)
(b) (i) Draw 2-way flow control valve in a bypass circuit. **04**
Calculate the power losses at flow control and pressure relief valve of a speed control system with flow control valve in by pass and fixed displacement pump. Calculate the power portion required and complete the power diagram. p_1= 150 bar, Q_1=100 lpm, p_2=100 bar and Q_2=70 lpm
(ii) Illustrate the application of Shuttle valve & twin pressure valve through a typical Pneumatic circuit. **03**

OR

Q.5 **(a)** (i) Plastic parts are to be placed in a holding fixture and stamped pneumatically. **04**
The cylinder 1A pushes the holding fixture under the stamping cylinder 2A. After the stamping operation, the stamping cylinder 2A returns immediately to its initial position. Finally cylinder 1A returns.
Draw the pneumatic circuit by cascade method.
Position step diagram is given in Fig.3
(ii) Describe the following: **03**
1. Quick Exhaust valve
2. Shuttle Valve.
(b) (i) In a hydraulic system cylinder piston diameter is 150 mm and piston rod diameter is 80 mm. If piston rod side pressure is 200 bar and discharge is 70 litres per minute, what will be pressure & discharge on piston side? **04**
(ii) What is throttle-out and throttle-in as applied to speed control of pneumatic cylinder. Describe any one. **03**
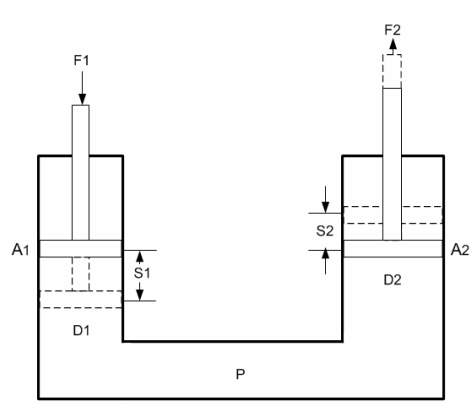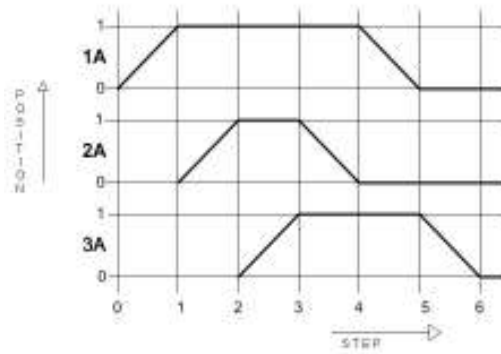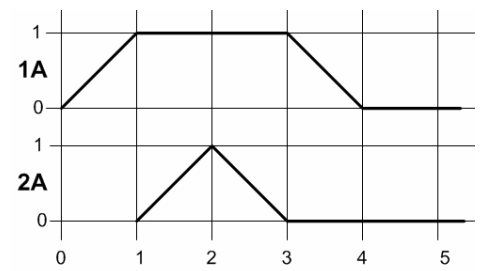
Fig.1

Fig.2

Fig.3

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