Total No. of Questions : 8]

SEAT No. :

P3605

[Total No. of Pages : 3

[5153]-515
T.E. (Mechanical) (Semester - I)
HYDRAULICS AND PNEUMATICS
(2012 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***AnswerQ. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 7 or Q. 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figure to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Compare Characteristics of hydraulic and pneumatic systems with mechanical system. **[6]**

b) What is accumulator and explain any one application of it. **[6]**

c) The displacement of a pump operating at 1000 RPM at a pressure of 10 bar is 100cm^3. The input torque from the prime mover is 120 Nm. If it delivers 0.0015 m3/s of oil, determine: **[8]**

i) Overall efficiency of the pump.

ii) Theoretical torque required to operate through pump.

iii) Volumetric efficiency.

OR

Q2) a) List the fields of application where fluid power can be used more effectively than any power sources. Explain in short **[6]**

b) State types of filters and draw their various locations used in fluid power system in details. **[8]**

c) State and explain governing law used in fluid power system in details **[6]**

Q3) a) Draw and explain any three center position of direction control valve used in industrial circuit. **[6]**

b) What is the purpose of providing pilot operated check valve in hydraulic circuit. Explain in short a typical application of pilot operated check valve. **[6]**

c) Draw the counterbalance circuit and explain it's working **[6]**

OR

P.T.O.

Q4) a) Explain regenerative circuit for following conditions. **[6]**

i) when the speed of the extension stroke will be equal to the retraction stroke of the cylinder.

ii) When the speed of the extension stroke will be greater than the retraction stroke of the cylinder.

b) Draw the fail safe circuit and explain it's working **[6]**

c) What are the possibilities to draw synchronization circuit explain any one of the circuit in details. **[6]**

Q5) a) Explain with a neat sketch the shuttle valve and draw a typical circuit showing all parts. **[6]**

b) Explain with a neat sketch the working of a quick exhaust valve. **[6]**

c) What are various efficiencies of a hydraulic motor. **[4]**

OR

Q6) a) Draw circuit for : **[6]**

i) Controlling speed of pneumatic double acting cylinder.

ii) Speed control of a pneumatic motor

b) Craw a typical compressed air generation and distribution system **[6]**

c) Explain with a sketch a typical air motor **[4]**

Q7) A machine has two slides 'A' and 'B' which are to be operated hydraulically. The cylinder 'A' has a load of 10 KN and a stroke of 50cm to be completed in 20 sec. The cylinder 'B' has to overcome a load of 15 KN and has a stroke of 50 cm to be complete in 29 sec. The two cylinders are to be moved simultaneously. They are to be retracted as soon as they reach the end position. The loads during returns, strokes are 5 KN and 3.5 KN respectively. Individual direction control valves are provided for the two cylinders. Draw a suitable circuit to achieve this requirement. Select different components you have used in the circuit from the given data mention the rating of the components in case it is not available in the given data. Assume reasonable values of data in case if it is not provided in the problems (Discuss functional approach, strength approach and selection approach along with suitable circuit diagram) **[16]**

OR

Q8) Two identical cylinders A and B are to be operated simultaneously. The cylinder A moves against a load of 25 KN while the cylinder B has a load of 20 KN. Both the cylinders have a stroke of 1 m. The working stroke is to

be completed in about 20 seconds time. The return stroke of cylinder B is to start only after the cylinder A is completely retracted. The return speeds are to be as fast as possible. Draw a circuit which will fulfill these requirements. Select different components you have used in the circuit from the given data mention the rating of the components in case it is not available in the given data. Assume reasonable values of data in case if it is not provided in the problems (Discuss functional approach, strength approach and selection approach along with suitable circuit diagram) **[16]**

DATA

1. Suction Strainer :

Model	Flow Capacity (/pm)
S_1	38
S_2	76
S_3	152

2. Pressure Gauge :

Model	Range (bar)
PG_1	0 - 25
PG_2	0 - 40
PG_3	0 -100
PG_4	0 - 160

3. Vane Pump :

Model	Delivery in / pm		
	at 0 bar	at 35 bar	at 70 bar
P_1	8.5	7.1	5.3
P_2	13.9	11.4	9.5
P_3	17.6	15.1	14.3
P_4	25.1	23.8	22.4
P_5	39.0	37.5	35.6

4. Relief Valve :

Model	Flow capacity (/ pm)	Max Working Pressure & bar
R_1	11.4	70
R_2	19	210
R_3	30.4	70
R_4	57	105

5. Flow control Valve :

Model	Working Pressure (bar)	Flow Range (/pm)
F_1	70	0-4.1
F_2	105	0-4.9
F_3	105	0-16.3
F_4	70	0-24.6

6. Directional Control Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
D_1	350	19
D_2	210	38
D_3	210	76

7. Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
C_2	210	15.2
C_3	210	30.4
C_5	210	76

8. Pilot Operated Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
PO_1	210	19
PO_2	210	38
PO_3	210	76

9. Cylinder-(Max Working Pressure-210 bar)

Model	Bore dia. (mm.)	Rod dia (mm)
A_1	25	12.5
A_2	40	16
A_3	50	25
A_4	75	45
A_5	100	50

10. Oil Reservoirs :

Model	Capacity (litres)
T_1	40
T_2	100
T_3	250
T_4	400
T_5	600