Total No. of Questions :8]

SEAT No. :

P2799

[Total No. of Pages :5

[4958]-1015
T.E.(Mechanical)
HYDRAULICS AND PNEUMATICS
(2012 Pattern) (Semester - I) (End Semester) (302045)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Draw ISO symbols for the following components: **[6]**

i) 4×2 hydraulically pilot operated spring spring offset DCV

ii) Gas charged accumulator

iii) Pressure reducing valve

iv) Bi-directional hydraulic motor

v) Pressure compensated flow control valve

vi) Quick Exhaust valve

b) Explain what do you mean by: **[6]**

i) Positive displacement pump

ii) Variable displacement pump

c) An 8 cm diameter hydraulic cylinder has a 4 cm diameter rod. If the cylinder receives flow at 100 LPM and 12 MPa, find: **[8]**

i) Extension and retraction speeds,

ii) Extension and retraction load carrying capacities

OR

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Q2) a) Draw a simple hydraulic system showing all its essential components and explain the function of each. **[6]**

b) Draw an ISO symbol of a pressure intensifier. Explain its working. **[6]**

c) A hydraulic motor has displacement of 164 cm^3 and operates with a pressure of 70 bar and speed of 2000 rpm. If the actual flow rate consumed by the motor is 0.006 m^3/s and actual torque delivered by motor is 170 Nm, find: **[8]**

i) Volumetric efficiency,

ii) Mechanical efficiency,

iii) Overall efficiency,

iv) Actual power delivered by motor.

Q3) a) Explain the different methods of DCV actuation. **[6]**

b) Draw a neat sketch of Actuator locking circuit and explain its working. **[6]**

c) Explain regenerative circuit with a neat sketch. **[6]**

OR

Q4) a) Classify different types of control valves used in the hydraulic circuit. **[6]**

b) Draw a neat sketch of Pump unloading circuit and explain its working. **[6]**

c) Explain with neat sketch cylinder synchronization circuit with two cylinders connected in series. **[6]**

Q5) a) Draw and explain a throttle-in circuit used in pneumatics. **[6]**

b) Sketch compressed air generation and distribution system. **[6]**

c) Explain in short any two applications in industry requiring vacuum for their operation. **[4]**

OR

Q6) a) Explain the application of Shuttle Valve with a typical circuit. **[6]**

b) Explain the need of using FRL unit in pneumatic system. Also draw its ISO symbol. **[6]**

c) Differentiate between hydraulic and air motor. **[4]**

Q7) A machine tool cross slide is moved by means of a hydraulic system. The motion of the cylinder is as follows: **[16]**

a) Initially it moves through a distance of 250 mm against a load of 10 kN in about 5 sec.

b) It is followed by a working stroke of another 120 mm against an effective load of 25 kN. The feed rate during this part of the stroke is required to be 1m/min.

c) The return stroke is as fast as possible.

A meter-out circuit is used for speed control. Draw a circuit which will fulfill these requirements. Select different components used in the circuit from the data given. Mention ratings of components in case it is not available in the given data.

OR

Q8) a) Draw a simple hydraulic circuit which will operate a hydraulic cylinder of a machine. The load during the forward stroke is 20 kN and that during the return stroke is approx. 10kN. The forward and return speeds are about 3.0 m/min and 5.0 m/min. respectively. Total stroke of the cylinder is 300 mm. provision is required to hold the cylinder any where in between the end positions. Select different components from the data given. Specify ratings of the components in case it is not available. **[10]**

b) Label the components and analyze the circuit shown in Figure 8b. **[6]**

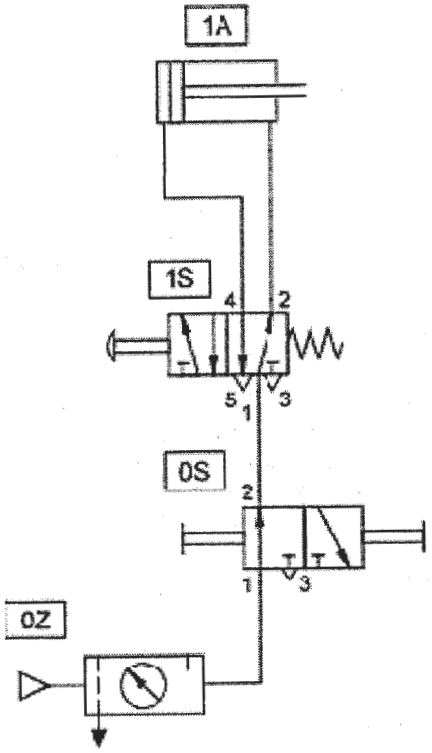

Figure 8b

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	12.9	11.4	9.5
P_3	17.6	16.1	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_1	210	15.2
C_2	210	30.4
C_3	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	35
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

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