

Total No. of Questions : 12]

SEAT No. :

P3863

[5058]-315

[Total No. of Pages : 5

T.E. (Mechanical)

HYDRAULICS AND PNEUMATICS

(End Sem) (2012 Course) (302045) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer 6 Questions.*
- 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) Discuss important factors considered for selection of hydraulic fluids. [4]
b) What are the different materials used for seals in hydraulic system components. What are the points considered while selecting seal material? [4]

OR

- Q2)** a) Explain difference between flared fitting and a compression fitting. [3]
b) What are the functions of reservoir? Draw a neat sketch of standard reservoir by showing its internals, external features. [5]
- Q3)** a) State the important factors for selection of a pump for hydraulic power application. [2]
b) Explain the applications of accumulator as [4]
i) Power saving device.
ii) Hydraulic shock absorber device.

OR

- Q4)** A Pump used in power unit is found to be making noise. What may be the probable causes of this noise? What are the different remedies to reduce this noise? What precautions are taken to avoid the pump noise? Explain in brief. [6]

P.T.O.

Q5) What is the purpose of providing cushioning in cylinder? With the help of neat sketch explain how it is achieved. [6]

OR

Q6) What factors will you consider in selecting a hydraulic motor? Mention two allocations of usages of hydraulic motor with their types. [6]

Q7) a) Draw and explain the application of a pilot check valve for locking a double-acting cylinder. [8]

b) List four important considerations to be taken into account while designing a hydraulic circuit. [4]

c) Analyze the circuit shown in Fig. 1 and label the components. [6]

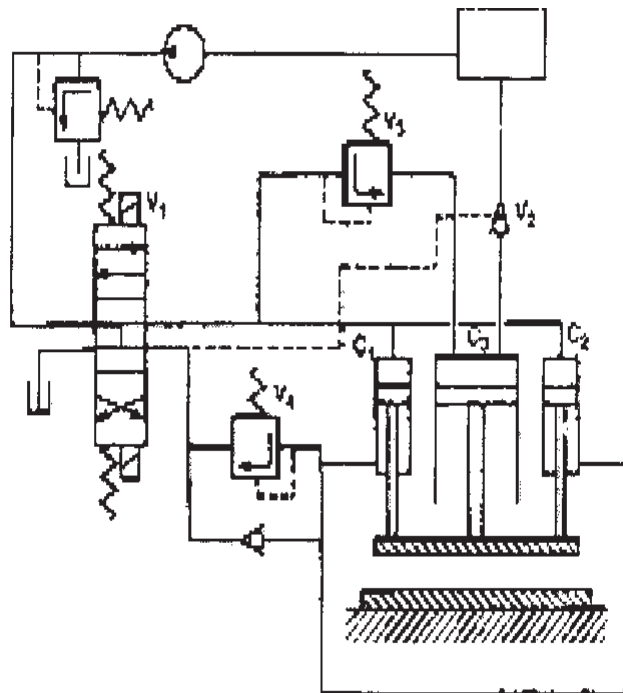


Fig.1

OR

Q8) a) Draw and explain fail-safe circuit? [8]

b) What are the advantages of a regenerative circuit? [4]

- c) Analyze the circuit shown Fig. 2 and label the components. [6]

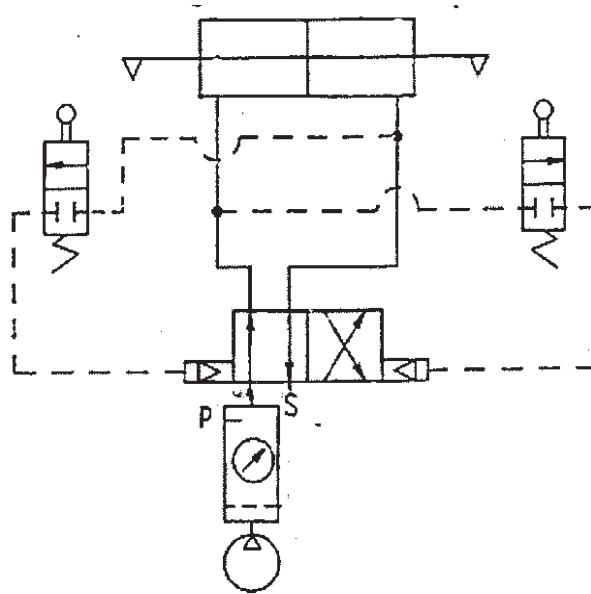


Fig.2

- Q9)** a) With the help of neat sketch explain a typical compressed air generation and distribution system. [6]
 b) Explain with neat sketch working of “AND” valve and with the help of circuit diagram explain any one typical application of it. [6]
 c) Name four reasons for considering the use of pneumatics instead of hydraulics. [4]

OR

- Q10)**a) What is the purpose of providing ‘Pressure Regulator’ in pneumatic circuits? [8]

Explain with the help of neat sketch construction and working of any one type of pressure regulator.

- b) Explain with neat sketch working of “AND” valve and with the help of circuit diagram explain any one typical application of it. [8]

- Q11)**a) Two double acting hydraulic cylinders are synchronized by connecting them in series. The load acting on each cylinder is 4000 N. Cylinder 1 has the piston diameter 50 mm and rod diameter 20 mm. If the cylinder extends 200 mm in 0.05 second, find the following: [10]

- i) The pressure requirement of the pump.

- ii) Flow capacity of the pump.
 - iii) Pump output.
 - iv) Capacity of motor driving pump if overall efficiency of pump is 80%.
- b) An actuator forward speed is controlled by a meter-in circuit. The pressure setting of relief valve is 50 bar and the pump discharge is 30 liters/min. The cylinder has to carry a load of 3600 N during the forward motion. The area of piston is 15 cm² and rod area is 8 cm². The flow control valve with internal free flow check is set to allow only 10 liters/min. [6]
- Calculate the pressure drop across the flow control valve during extension, forward speed and return speed of the circuit.

OR

Q12) A press cylinder having a bore diameter of 140 mm and a 100 mm diameter rod is to have an initial approach speed of 5 m/min and a final pressing speed of 0.5 m/min. The system pressure for a rapid approach is 40 bar and for final pressing is 350 bar. A two-pump, high-low system is to be used. Assume overall efficiency of 0.85 for all pumps. Draw hydraulic circuit and determine the following: [16]

- a) The flow to the cylinder for the rapid approach and final pressing.
- b) Suitable discharge of high pressure and low pressure pump.
- c) The pump motor power required for high pressure and low pressure pump.
- d) The pump motor power required if single pump of 350 bar pressure rating is used.
- e) Saving in power consumption if two pumps are used in system.

Based in above calculations suggest rating and settings of all components used in circuit.

DATA

1. Suction Strainer:

Model	Flow capacity (lpm)
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 (lpm)	Max. Working pressure and 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 (lpm)
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 (lpm)
D ₁	350	19
D ₂	210	38
D ₃	210	76

7. Check Valve:

Model	Working Pressure (bar)	Flow Range (lpm)
C ₁	210	15.2
C ₂	210	30.4
C ₃	210	76

8. Sequence Valve:

Model	Max. Working Pressure (bar)	Flow Capacity (lpm)
PO ₁	210	19
PO ₂	210	38
PO ₃	210	76

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

Model	Born 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	60

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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