



[4658] – 515

<b>Seat No.</b>	
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**T.E. (Mechanical) (Semester – I) Examination, 2014  
HYDRAULICS AND PNEUMATICS  
(2012 Pattern)**

Time : 3 Hours

Max. Marks : 70

- Instructions :** 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**.

1. Draw ISO symbols for the following components : **6**
- i) 4 × 3 pneumatically double pilot operated DCV.
  - ii) Pressure compensated flow control valve.
  - iii) Single acting pressure intensifier.
  - iv) Counterbalance valve with bypass check valve.
  - v) Double rod end hydraulic cylinder.
  - vi) Bi-directional hydraulic motor.

OR

2. State the sources of contamination in hydraulic systems and its remedial measures. **6**
3. a) What are the functions of reservoirs ? Draw a neat sketch of a standard reservoir showing its internal and external features. **6**
- b) What is the meaning of positive displacement pump ? State its purpose in fluid power systems. **2**

OR

4. a) State the different filter locations in hydraulic systems. Explain any one in detail with a neat sketch. **6**
- b) What do you mean by variable displacement pump ? State any two variable displacement pumps. **2**
5. A mass of 2000 kg is to be accelerated horizontally upto a velocity of 1 m/s from rest over a distance of 50 mm. The co-efficient of friction between the load and guide is 0.16. Calculate the bore of the cylinder required to accelerate the load if the maximum allowable pressure at the full bore end is 100 bars. Assume the back pressure at the annular end of the cylinder as zero. **6**

OR

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6. A 5000 N weight is to be lifted upward in a vertical direction for the system shown in Figure 6b. Find the cylinder force required to
- Move the weight at a constant velocity of 2.25 m/s.
  - Accelerate the weight from zero velocity to 2.25 m/s in 0.5 s.

6

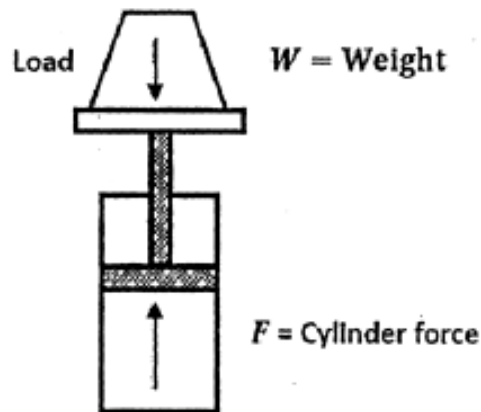


Figure 6b

- Draw a simple sketch and ISO symbol of a pressure relief valve, and explain its working. State its importance in hydraulic systems. 6
  - A double acting cylinder is hooked in regenerative circuit. Maximum pressure setting of PRV is 100 bars. Piston area =  $120 \text{ cm}^2$ , Rod area =  $60 \text{ cm}^2$ , if pump flow is  $0.0016 \text{ m}^3/\text{s}$ , find cylinder speed and load carrying capacity during extension and retraction stroke. Comment on the power delivered by hydraulic cylinder during both strokes. 6
  - Draw and explain counterbalance circuit. 6

OR

- With neat sketches, explain the advantages of 'Tandem center' over a 'Closed center' design in a DCV. 6
  - Draw a cylinder synchronization circuit for two cylinders connected in series. 6
  - Draw actuator locking circuit by using pilot check valves. 6
- Discuss the factors for selection of compressors used in pneumatic systems. 8
  - Write in short on 'Applications of pneumatics in low cost automation'. 6
  - State any two industrial applications of vacuum. 2

OR

- Explain 'Shuttle (OR) valve' with a neat sketch. State its application with a typical circuit. 8
  - Explain construction and working of Filter and Lubricator used in pneumatic systems. 8



11. a) Analyze the circuit shown in Figure 11a.

6

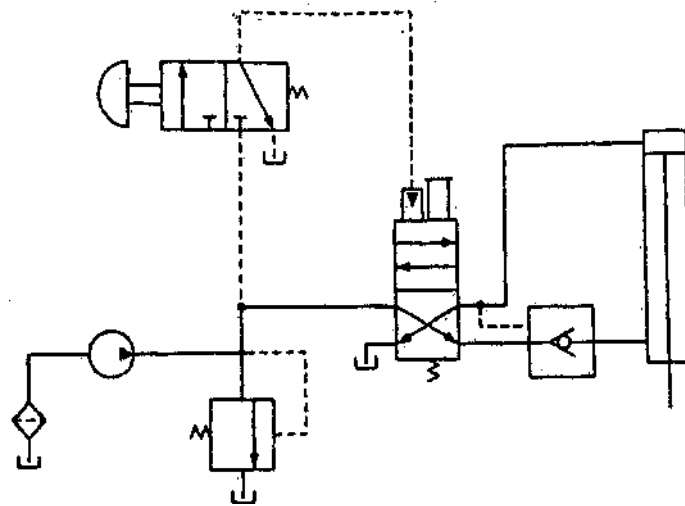


Figure 11a

b) A hydraulic cylinder is used to operate a machine. The load during the forward stroke is 20 kN and that during the return stroke is approx. 10 kN. The forward and return speeds are about 3.5 m/min. and 5.5 m/min respectively. Total stroke of the cylinder is 300 mm. Provision is required to hold the cylinder anywhere between the end positions. Develop a suitable hydraulic circuit and select different components from the data given. Specify the ratings of the components in case it is not available in the given data.

10

OR

12. Sequential operations of two double-acting pneumatic cylinders are required as follows :

16

- 1) Cylinder A extends
- 2) Cylinder B extends
- 3) Cylinder A retracts
- 4) Cylinder B retracts

Develop a pneumatic circuit using pilot operated 4/2 DCV and roller operated valves.

(Do not use sequence valves)



## DATA

## 1. Suction Strainer :

Model	Flow Capacity (/pm)
S <sub>1</sub>	38
S <sub>2</sub>	76
S <sub>3</sub>	152

## 2. Pressure Gauge :

Model	Range (bar)
PG <sub>1</sub>	0 - 25
PG <sub>2</sub>	0 - 40
PG <sub>3</sub>	0 - 100
PG <sub>4</sub>	0 - 160

## 3. Vane Pump :

Model	Delivery in / pm		
	at 0 bar	at 35 bar	at 70 bar
P <sub>1</sub>	8.5	7.1	5.3
P <sub>2</sub>	12.9	11.4	9.5
P <sub>3</sub>	17.6	16.1	14.3
P <sub>4</sub>	25.1	23.8	22.4
P <sub>5</sub>	39.0	37.5	35.6

## 4. Relief Valve :

Model	Flow capacity (/ pm)	Max Working Pressure & bar
R <sub>1</sub>	11.4	70
R <sub>2</sub>	19	210
R <sub>3</sub>	30.4	70
R <sub>4</sub>	57	105

## 5. Flow control Valve :

Model	Working Pressure (bar)	Flow Range (/pm)
F <sub>1</sub>	70	0-4.1
F <sub>2</sub>	105	0-4.9
F <sub>3</sub>	105	0-16.3
F <sub>4</sub>	70	0-24.6

## 6. Directional Control Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
D <sub>1</sub>	350	19
D <sub>2</sub>	210	38
D <sub>3</sub>	210	76

## 7. Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
C <sub>1</sub>	210	15.2
C <sub>2</sub>	210	30.4
C <sub>3</sub>	210	76

## 8. Pilot Operated Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
PO <sub>1</sub>	210	19
PO <sub>2</sub>	210	38
PO <sub>3</sub>	210	76

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

Model	Bore dia. (mm.)	Rod dia. (mm)
A <sub>1</sub>	25	12.5
A <sub>2</sub>	40	16
A <sub>3</sub>	50	35
A <sub>4</sub>	75	45
A <sub>5</sub>	100	60

## 10. Oil Reservoirs :

Model	Capacity (litres)
T <sub>1</sub>	40
T <sub>2</sub>	100
T <sub>3</sub>	250
T <sub>4</sub>	400
T <sub>5</sub>	600