(3)

*Total No of Questions: [12]* *SEAT NO. :*

[Total No. of Pages : 3]

# *B. E. (Mechanical ) 2008 course*

## *Industrial Fluid Power (Code: 402043)*

## *May 2014 (Semester - I)*

*Time: 3 Hours* *Max. Marks : 100*

***Instructions to the candidates:***

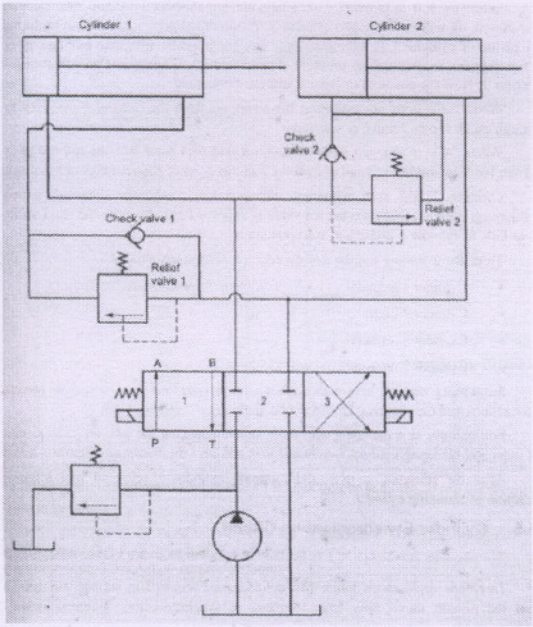
1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary***

### SECTION I

| | | | |
|---|---|---|---|
| Q1) | a) | Explain the different types of hydraulic fluids. | [8] |
| | b) | Differentiate between different types of hydraulic filters. | [8] |
| | | **OR** | |
| Q2) | a) | What are the functions of hydraulic reservoirs? State different types of reservoirs. | [8] |
| | b) | Explain the different types of hydraulic seals used in fluid power system. | [8] |
| Q3) | a) | What are the various functions of hydraulic accumulators? | [9] |
| | b) | Explain the working of radial piston pump with a neat sketch. | [9] |
| | | **OR** | |
| Q4) | a) | Explain with a neat sketch the working of 4/3 tandem centered Direction Control Valve with a typical application. | [10] |
| | b) | Explain the advantages of pilot operated pressure relief over direct operated PRV. | [8] |
| Q5) | a) | Explain with a neat sketch the working of Temperature compensated flow control valve. | [8] |
| | b) | Describe the functions of check valve used in hydraulic system with simple circuits. | [8] |
| | | **OR** | |
| Q6) | a) | Draw symbols for i) FRL ii) Filter iii) Heater iv) Counter balance valve V) Pilot operated check valve vi) closed centered DCV vii) Reservoir viiii) Cushioned cylinder. | [8] |
| | b) | Explain the working of pilot operated pressure reducing valve. | [8] |

### SECTION II

| | | | |
|---|---|---|---|
| Q7) | a) | What is the purpose of providing cushioning in cylinders? With the help of neat sketch explain how it is achieved? | [8] |
| | b) | Draw and explain regenerative circuit used in hydraulic system. | [8] |
| | | **OR** | |
| Q8) | a) | Discuss different cylinder mounting methods with neat sketches. | [8] |

| | | | |
|---|---|---|---|
| | b) | Analyze the given hydraulic circuit.<br>  <br> | [8] |
| Q9) | a) | Draw a simple sketch and explain in short the compressed air system in a medium scale industry. | [8] |
| | b) | Describe with neat sketch:<br>i) Shuttle Valve<br>ii) Quick exhaust valve. | [8] |
| | | **OR** | |
| Q10) | a) | Explain with a neat sketch the working of time delay valve used in pneumatic circuit. | [8] |
| | b) | Draw and explain hydraulic circuit for automatic reciprocation of a hydraulic cylinder using sequencing valves. | [8] |
| Q11) | a) | Sequential operations of two pneumatic cylinders are required as follows:<br>i) Cylinder "A" extends,<br>ii) Cylinder "B" extends,<br>iii) Cylinder "B" retracts,<br>iv) Cylinder "A" retracts.<br>Develop a pneumatic circuit using starting valve, pilot operated 4/2 direction control valve and cam / roller operated valves to maintain proper sequence. Do not use solenoid operated valves. | [12] |
| | b) | Why pneumatic system is termed as low cost automation? | [6] |
| | | **OR** | |
| Q12) | | A machine slide is moved by means of hydraulic cylinder. The motion of the cylinder is as follows:<br>a) Initially it moves through a distance of 250 mm against a load of 15000 N in about 5 seconds.<br>b) It is followed by a working stroke of 100 mm against an effective load of 35000 N. The feed rate during this part of the stroke is required to be between 0.5 to 1.0 m/min.<br>c) The return stroke is to be as fast as possible.<br>A meter out circuit is to be used. Draw a circuit which will fulfill these requirements.<br>Select different components you have used in the circuit from the given data.<br>Note: Data sheet for question no. 12. | [18] |
| | | | |

# Data sheet

(a) Suction strainer:

| Model | Flow Capacity (lpm) |
|---|---|
| $S_1$ | 38 |
| $S_2$ | 76 |
| $S_3$ | 152 |

(b) Pressure gauge:

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

(c) Vane pump:

| Model | Delivery in lpm | | |
|---|---|---|---|
| | 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 |

(d) Relief valve:

| Model | Flow capacity (lpm) | Max. working pressure & bar |
|---|---|---|
| $R_1$ | 11.4 | 70 |
| $R_2$ | 19.0 | 210 |
| $R_3$ | 30.4 | 70 |
| $R_4$ | 57.0 | 105 |

(e) 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 |

(f) Directional control valve:

| Model | Max. working pressure & bar | Flow capacity (lpm) |
|---|---|---|
| $D_1$ | 350 | 19 |
| $D_2$ | 210 | 38 |
| $D_3$ | 210 | 76 |

(g) Check valve:

| Model | Max. working Pressure & bar | Flow capacity (/pm) |
|---|---|---|
| $C_1$ | 210 | 15.2 |
| $C_2$ | 210 | 30.4 |
| $C_3$ | 210 | 76 |

(h) Pilot operated check valve:

| Model | Max. working Pressure (bar) | Flow capacity (lpm) |
|---|---|---|
| $PO_1$ | 210 | 19 |
| $PO_2$ | 210 | 38 |
| $PO_3$ | 210 | 76 |

(i) Cylinder (Max. working pressure 210 bar)

| Model | Bore diameter (mm) | Rod diameter (mm) |
|---|---|---|
| $A_1$ | 25 | 12.5 |
| $A_2$ | 40 | 16 |
| $A_3$ | 50 | 35 |
| $A_4$ | 75 | 45 |
| $A_5$ | 100 | 50 |

(j) Oil reservoirs:

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