

Total No. of Questions : 12]

SEAT No. :

P733

[Total No. of Pages : 4

[4659] - 34

**B.E. (Mechanical)**  
**INDUSTRIAL FLUID POWER**  
**(2008 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer 3 questions from Section I and 3 questions from Section II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Draw a simple hydraulic circuit showing all its essential components. State the function of each component. [6]
- b) List important properties of fluid. [6]
- c) What are additives and inhibitors used in the hydraulic circuit. [6]

OR

- Q2)** a) What is a bypass filter? State its advantages and disadvantages. [6]
- b) Explain different types of seal. Explain any one in detail. [6]
- c) Explain the difference between flared and flareless fitting. [6]
- Q3)** a) What are the functions of reservoirs ? Draw a neat sketch of a standard reservoir showing all its features. [6]
- b) Explain with a sketch the operation of a vane pump. [6]
- c) Explain any two applications of an accumulator. [4]

**P.T.O.**

OR

- Q4)** a) Compare characteristics, advantages and applications of gear pumps and vane pumps. [8]  
b) Explain with a neat sketch a axial piston pump. How do you compensate for pressure variations. [8]
- Q5)** a) Compare the advantages and disadvantages of the three methods of flow control used in Fluid power systems. [8]  
b) What is a pilot operated check valve? Draw a circuit to explain its application. [8]

OR

- Q6)** a) What is a unloading valve. With a neat sketch explain its working and application. [8]  
b) Differentiate direct operated and pilot operated Relief valve. [4]  
c) When open centre and closed centre position direction control valves are used. [4]

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### SECTION - II

- Q7)** a) What do you mean by 'cushioning of cylinders'? Explain with a neat sketch. [8]  
b) Draw a regenerative circuit used in hydraulic system. Discuss. [10]  
i) When the speed of extension stroke will be equal to the speed of retraction stroke.  
ii) When the speed of extension stroke will be greater than the retraction stroke.

OR

- Q8)** a) A hydrostatic transmission operating at 70 bar pressure has the following characteristics. [10]

Pump

$$V_D = 82 \text{ cm}^3$$

$$\eta_v = 82\%$$

$$\eta_m = 88\%$$

$$N = 500 \text{ rpm}$$

Find the

i) Displacement of the motor.

ii) Motor output torque.

- b) Draw and explain Hi - Lo (double - pump) circuit. [8]

Motor

$$V_D = ?$$

$$\eta_v = 92\%$$

$$\eta_m = 90\%$$

$$N = 400 \text{ rpm}$$

- Q9)** a) Explain the working of FRL unit used in pneumatic systems. Also discuss the purpose of providing the same in pneumatics. [8]
- b) Explain with a neat sketch working of a shuttle valve with a typical application. [8]

OR

- Q10)**a) Explain working of a Time delay valve with a typical application. [8]
- b) Draw and explain Two handed safety circuit used in pneumatics. [8]

**Q11)**a) The piston rod of a DAC is to extend when a  $3 \times 2$  way push button valve is actuated. The cylinder is to remain extended until a second push button is actuated and if the first push button has been released. The cylinder is to then return to the initial position. It is to remain in the initial position until a new start signal is given. Develop a suitable pneumatic circuit for the given application. [6]

- b) Develop a simple hydraulic circuit which will operate a hydraulic cylinder of a machine. The load during forward stroke is 15 kN and that during return stroke is 8.5 kN. The forward and return speeds are about 3.0 m/min and 5.5 m/min respectively. Total stroke of the cylinder is 300mm. Provision is required to hold the cylinder any where between the end positions. Select different components from the data given, and specify ratings in case not available in given data. [10]

**Q12)**A hydraulic actuator is used to operate a machine tool slide. The motion of the cylinder is as follows :- [16]

- a) The load during the first 250 mm is 10 kN. The piston moves through this distance in 5 seconds.
- b) It then follows a working stroke of 120 mm against an effective load of 35 kN. The feed rate required is between 0.5 to 1.5 m/min.
- c) The return stroke is to be as fast as possible. Propose a meter - out circuit for speed control. Draw the circuit and select different components used, from the data given. Specify ratings in case the components are not available in given data.

**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	50

**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

