

Total No. of Questions : 12]

SEAT No. :

[Total No. of Pages : 4

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B.E. (Mechanical)

HYDRAULICS AND PNEUMATICS

(2015 Pattern) (Semester - I) (End Sem.) (402041)

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.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) Explain construction, working and application of external gear pump. [6]
b) State and Explain governing laws used in design of hydraulic system. [4]

OR

Q2) a) A gear pump has 75-mm outside diameter, a 50-mm inside diameter, and a 25-mm width. If the volumetric efficiency is 90% at rated pressure, what is the corresponding actual flow rate? The pump speed is 1000 rpm. [6]

b) State different selection criteria of pumps for hydraulic Power transmission system. [4]

Q3) a) State and Explain any two applications of accumulator. [4]

b) Draw Types of cylinders and mountings with their names. [6]

OR

Q4) a) State design considerations for cylinders, explain concept of Cushioning of cylinders. [6]

b) Draw symbols for

- i) Sequence valve
- ii) Cushioned cylinder
- iii) Double acting pressure - intensifier
- iv) Unloading valve
- v) Reversible motor
- vi) Pilot operated pressure reducing valve
- vii) Accumulator
- viii) Hose

P.T.O.

Q5) Explain construction working and application of Hydraulic Components Any two. [10]

- a) Direction Control Valves 4/3
- b) Flow Control Valves - Pressure compensated
- c) Pressure reducing valve
- d) Servo Valves

OR

Q6) Explain construction working and application of Hydraulic Components - Any Two. [10]

- a) Relief Valve-Direct Acting
- b) Cartridge Valves
- c) Counter Balance Valve
- d) Unloading Valve

Q7) a) Draw Speed control (Meter in, Meter out and bleed off) circuit. [6]

b) Draw Regenerative circuit, state its importance. [6]

OR

Q8) a) Write note on Contamination and sources of contamination. [6]

b) Draw motor breaking circuit. [6]

Q9) a) Explain Principles of Pneumatics and laws. [6]

b) State application of pneumatics in low cost automation and in industrial automation with example. [8]

OR

Q10) a) Write note on pneumatic actuators. [8]

b) State industrial applications of vacuum. [6]

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Q11) a) State design procedure of hydraulics circuit for any practical application using manufacture catalogue. **[6]**

b) Sequential operations of two pneumatic cylinders are required as follows :

- Cylinder "A" extends,
- Cylinder "B" extends,
- Cylinder "B" retracts,
- Cylinder "A" retracts,

Develop a pneumatic circuit using starting valve, pilot operated 5/3 or 5/2 direction control valve and cam/roller operated valves to maintain proper sequence. Do not use solenoid operated valves. **[8]**

OR

Q12) A machine slide is moved by means of hydraulic cylinder. The motion of the cylinder is as follows:

- Initially it moves through a distance of 250 mm against a load of 15000N in about 5 seconds,
- 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.

c) The return stroke is to be as fast as possible.

A meter out circuit is to be used. Draw a circuit which will fulfill these requirements.

Select different components you have used in the circuit from the given data.

Note: Data sheet for question no. 12.

[14]

(e) 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	70
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 (lpm)
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 (lites)
T ₁	40
T ₂	300
T ₃	250
T ₄	400
T ₅	600