Code No: 157BQ **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, July/August - 2023

FLUID POWER SYSTEMS

(Mechanical Engineering)

Time: 3 Hours **Max.Marks:75**

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Define the term "prime mover".	[2]
b)	What factors are responsible for the high responsiveness of hydraulic devices?	[3]
c)	Draw the schematic diagram of double-acting cylinder along with its symbol.	[2]
d)	What is a telescopic cylinder? List its usage.	[3]
e)	Draw the symbolic diagram of flow control valves.	[2]
f)	Classify the valves based on the signal type, actuation method and construction.	[3]
g)	What is a seal and what are their functions?	[2]
h)	Why air is used as fluid medium in pneumatic systems?	[3]
i)	What is a relay?	[2]
j)	What are the benefits of ladder diagram?	[3]

PART – B

(50 Marks)

2.a) Give a comparisons of electrical, hydraulic and pneumatic systems based on energy source and storage, distribution of controlling forces and actuators.

b) Fluid power is well suited for the automation applications. Justify the statement with suitable examples. [6+4]

OR

3.a) A pump has a displacement volume of 100 cm^3. It delivers 0.0015 m^3/s at 1000 rpm and 50 bar. If the prime mover input torque is 100 N m, what is the overall efficiency of the pump. What is the theoretical torque required to operate the pump?

b) Draw and explain basic vane pump overall and volumetric efficiencies as a function of pump speed (rpm) for different pressure levels. [6+4]

4.a) A hydraulic cylinder has a rod diameter equal to one-half the piston diameter. Determine the difference in load-carrying capacity between extension and retraction if the pressure is constant.

b) Explain briefly about the various types of rotary actuators. [5+5]

OR

5.a) Differentiate between a pressure-compensated and non-pressure-compensated flow control valve with suitable sketches.

b) A 55-mm diameter sharp-edged orifice is placed in a pipeline to measure the flow rate. If the measured pressure drop is 300 kPa and the fluid specific gravity is 0.90, find the flow rate. [6+4]

6.a) With the help of a neat sketch, explain how the speed of a cylinder can be controlled using a proportional valve.

b) What is the purpose of servo valve in a proportional circuit? [6+4]

OR

7.a) Enumerate important considerations to be taken into account while designing a hydraulic circuit.

b) A double-acting cylinder is hooked up in a regenerative circuit. The relief-valve setting is 105 bar. The piston area is 130 cm^2 and the rod area is 65 cm^2. If the pump flow is 0.0016 m^3/s, find the cylinder speed and load-carrying capacity for the extending stroke and retracting stroke. [4+6]

8.a) Determine the beta ratio of a filter when, during test operation, 30000 particles greater than 20 µm enter the filter and 1050 of these particles pass through the filter. What is the beta efficiency?

b) List the causes and remedy for excessive noise, incorrect flow, pressure and faulty operations in the maintenance of a hydraulic system. [4+6]

OR

9.a) An 8 cm diameter pneumatic cylinder has a 4 cm diameter rod. If the cylinder receives flow at 100 LPM and 6 bar, find the extension and retraction speeds. Also find the extension and retraction load carrying capacities.

b) Classify the pneumatic cylinders based on cylinder's movement, cylinder's design and a give a brief description of one in each case. [5+5]

10. A pneumatically controlled double sliding door is used for a room to open and close by using push buttons. Double sliding door is to be controlled either from outside by pressing pushbutton or from inside by the same pushbutton. Develop a pneumatic control circuit to implement this given task. [10]

OR

11.a) Distinguish between travel-dependent control and time dependent control in a pneumatic system.

b) Write a short note on the applications of pneumatics in metal working and materials handling processes. [5+5]

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