

Code No: 157BQ

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 $0.0015 \text{ m}^3/\text{s}$ 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 $0.0016 \text{ m}^3/\text{s}$, 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 $20 \mu\text{m}$ 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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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, January/February - 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) What are the advantages of hydraulic system? [2]
- b) Write entire list of applications of fluid power in the automotive industry. [3]
- c) Sketch and explain double acting cylinder. [2]
- d) Briefly classify valves based on the type of function performed. [3]
- e) What is an FRL unit? Give the graphic symbol of it. [2]
- f) Explain the three stages of preparation of compressed air. [3]
- g) What is bleed-off circuit? [2]
- h) What is the difference between a strainer and filters? [3]
- i) Explain and draw the displacement time diagram? [2]
- j) Explain pressure dependent control in pneumatics? [3]

PART - B

(50 Marks)

- 2.a) With the neat sketch explain the components of hydraulic system.
- b) Explain the construction and working of an external gear pump. [5+5]

OR

- 3. Explain the working of unbalanced vane pump. Also obtain an expression for its theoretical discharge. [10]

- 4. Explain the working principle of pilot operated check valve with a neat sketch. Illustrate the graphical symbol of the valve. [10]

OR

- 5. Describe Flapper valve design and analysis? [10]

- 6. What is the principle and purpose of regenerative circuit? Explain the working of a typical regenerative circuit with neat sketch. [10]

OR

- 7. With a neat sketch, explain pump unloading circuit. [10]

8. Sketch and explain construction and principle of operation of a quick exhaust valve. [10]

OR

9. Explain with a neat sketch:

a) Time delay valve

b) Shuttle valve

c) Poppet valve

d) Solenoid valve.

[10]

10. Discuss the ladder diagram connections for a dual cylinder sequencing circuit for the following sequence of operations: A+ B+ B- A-. [10]

OR

11. Explain signal overlapping elimination using reversing valves. Draw a neat pneumatic circuit involving two cylinder and a reverse valve. [10]

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Hall Ticket No.:

NARSIMHAREDDY ENGINEERING COLLEGE
(UGC AUTONOMOUS)

IV B.Tech I Semester (NR20) Regular Examination, December 2023

FLUID POWER SYSTEMS
(Mechanical Engineering)

Time : 3 hours

Maximum marks: 75

- Note:
- This question paper contains two parts A and B
 - Part A is compulsory which carries 25 marks (1st 5 sub questions are one from each unit carry 2 Marks each & Next 5 sub questions are one from each unit carry 3 Marks). Answer all questions in Part A
 - Part B Consists of 5 Units. Answer any one full question from each unit. Each question carries 10 Marks and may have a, b sub questions

Part-A
Answer all questions

(25 Marks)

Q.No	Question	M	CO	BL
1)	a. What are the types of fluid power?	2	CO1	L2
	b. Differentiate between the positive and non-positive displacement pumps.	2	CO1	L3
	c. Discuss the function of an actuator.	2	CO2	L2
	d. Mention the symbolic representation of single and double acting cylinders.	2	CO2	L3
	e. What is an electro-pneumatic device?	2	CO3	L2
	f. State the purpose of the following fluid reservoir elements : (a) Strainer (b) Oil level gauge	3	CO1	L2
	g. List the essential components of a hydraulic system and state the function of any one component.	3	CO2	L2
	h. Draw the parallel synchronization circuit for cylinders and explain the conditions for achieving it.	3	CO2	L2
	i. What is the necessity of safety circuits in pneumatic systems?	3	CO2	L2
	j. Explain the operations of control devices like limit switches, timers and pressure switches	3	CO3	L2

Part-B
Answer any five questions
All Questions carry equal Marks

(50 Marks)

Q.No	Question	M	CO	BL
2)	UNIT-I			
	a. State the Pascal's law and discuss applications in fluid power systems. What are the different energy losses to be considered for the design?	5	CO1	L2
	b. Explain various components used in hydraulic systems along with their symbols of representation in the circuit diagram.	5	CO1	L3

OR

3)	a.	Describe the various functions of hydraulic fluids and discuss their desirable characteristics.	5	CO1	L3
	b.	What are the various applications of fluid power systems? Explain them with different control circuits.	5	CO1	L2
UNIT-II					
4)	a.	List various types of control valves used in hydraulic system and explain their functions along with their applications.	5	CO2	L2
	b.	Explain the working of hydraulic cylinder cushioning with a neat sketch	5	CO2	L3
OR					
5)	a.	Describe the flapper valve function along with its design procedure and analyse different forces.	5	CO2	L2
	b.	To make pressure compensation, the valves are arranged either in series or parallel. Discuss the importance of above arrangements for flow control	5	CO2	L3
UNIT-III					
6)	a.	Explain the working of hydraulic regenerative circuit with a neat sketch and discuss its major limitations.	5	CO3	L3
	b.	What do you understand by the synchronization of control circuits? Explain with a suitable example.	5	CO3	L2
OR					
7)	a.	Classify accumulators. Discuss the construction and working of bladder type accumulator	5	CO3	L2
	b.	With neat sketch explain the working of meter-in circuit.	5	CO3	L3
UNIT-IV					
8)	a.	Write the advantages of pneumatic systems used for different control circuits.	5	CO3	L2
	b.	Explain the valve arrangements for operation of logic controls of pneumatic systems and discuss the importance.	5	CO3	L3
OR					
9)	a.	Describe the various components used in pneumatic power systems and their symbols	5	CO3	L3
	b.	Draw and explain the functions of pneumatic check valve	5	CO3	L2
UNIT-V					
10)	a.	With neat sketch explain the working of meter-out circuit.	5	CO3	L2
	b.	Describe the working of program control unit and electro-pneumatic control unit and compare them.	5	CO3	L3
OR					
11)	a.	With a suitable circuit, explain the electro pneumatic control of double acting cylinder.	5	CO3	L2
	b.	Draw the pneumatic control circuit for the operation of assembly of different components in a assembly system	5	CO3	L3

Q.P Code: ME4109PE

Hall Ticket No.:

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NARSIMHAREDDY ENGINEERING COLLEGE
(UGC AUTONOMOUS)

IV B.Tech I Semester (NR20) Supplementary Examination, June 2024

FLUID POWER SYSTEMS
(Mechanical Engineering)

Time : 3 hours

Maximum marks: 75

- Note:**
- This question paper contains two parts A and B
 - Part A is compulsory which carries 25 marks (1st 5 sub questions are one from each unit carry 2 Marks each & Next 5 sub questions are one from each unit carry 3 Marks). Answer all questions in Part A
 - Part B Consists of 5 Units. Answer any one full question from each unit. Each question carries 10 Marks and may have a, b sub questions

Part-A
Answer all questions

(25 Marks)

Q.No	Question	M	CO	BL
1)	a. Write the function of an actuator.	2	CO1	L2
	b. What is the use of Directional control valve (DCV) in fluid power systems?	2	CO2	L1
	c. Classify the types of actuators.	2	CO2	L2
	d. Mention the symbolic representation of single switching and double switching directional control valves.	2	CO2	L2
	e. What are the devices used in electro-pneumatics?	2	CO3	L1
	f. Mention any two advantages of using air as a fluid medium over oil.	3	CO1	L2
	g. List out the different control valves used in hydraulic systems.	3	CO2	L2
	h. What is the purpose of accumulator?	3	CO2	L1
	i. Write the applications of pneumatic power circuits.	3	CO3	L1
	j. Briefly explain air as cushion for hydraulic system.	3	CO3	L2

Part-B
Answer any five questions
All Questions carry equal Marks

(50 Marks)

Q.No	Question	M	CO	BL
UNIT-I				
2)	a. List out the selection procedure of oil in Industrial hydraulic application.	5	CO1	L2
	b. State the Pascal's law and discuss applications in fluid power.	5	CO1	L3
OR				
3)	a. Explain the pumping theory and what factors are considered for selecting a hydraulic pump.	5	CO1	L3
	b. Brief the various advantages, disadvantages and applications of fluid power system.	5	CO1	L2

UNIT-II					
4)	a.	With a suitable sketch, describe the cushioning mechanism used in linear actuators.	5	CO2	L3
	b.	What are different forces acting in longitudinal and lateral directions of spool valve? Discuss them.	5	CO2	L2
OR					
5)		Explain the Internal construction and working of 4/2 spool valve. Draw its symbolic representation.	10	CO2	L3
UNIT-III					
6)		With a neat circuit diagram, explain regenerative circuit diagram used in drilling machine application.	10	CO3	L3
OR					
7)	a.	Classify various types of accumulators used for the control circuits and discuss their applications.	5	CO3	L2
	b.	Explain the hydraulic circuit with accumulator for any one application.	5	CO3	L3
UNIT-IV					
8)	a.	What are the advantages, disadvantages and applications of pneumatic systems used for different control circuits? Explain.	5	CO3	L2
	b.	Illustrate the differences between supply air throttling and exhaust air throttling.	5	CO3	L3
OR					
9)	a.	Explain the types of linear actuators	5	CO3	L3
	b.	With a simple circuit diagram, explain metered-out type of flow control	5	CO3	L2
UNIT-V					
10)	a.	With a neat sketch, explain the working of electro pneumatic control of double acting cylinder.	5	CO3	L2
	b.	Draw the pneumatic control circuit for the operation of assembly of different components in a assembly system.	5	CO3	L3
OR					
11)	a.	Explain the various steps involved in electro pneumatics.	5	CO3	L2
	b.	What are the applications of electro-pneumatic systems?	5	CO3	L2

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