



SHRI ANGALAMMAN COLLEGE OF  
ENGINEERING AND TECHNOLOGY  
(An ISO 9001:2008 Certified Institution)  
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FS81 504

## **Department of Mechanical Engineering**

### **ME 1305 Applied Hydraulics & Pneumatics**

#### **UNIT 1- FLUID POWER SYSTEMS AND FUNDAMENTALS**

##### **PART A**

1. State Pascal's law.
2. List the advantages and disadvantages of fluid power system?
3. Compare hydraulic and pneumatic system?
4. Draw the graphical symbol for three –position, four ways closed centre spring return solenoid actuated direction control valve?
5. Give the standard graphical symbol for FRL unit?
6. Give the graphical symbol for pressure reducing valve?
7. List any four application of fluid power system
8. Explain the term friction factor
9. What do you mean by non-positive displacement pump? State its implication
10. Name any four draw backs of fluid power system
11. Give the graphical symbol of pressure reducing valve?
12. Define viscosity and bulk modulus of a hydraulic fluid?
13. what are the major components of a hydraulic system?
14. State the continuity equation.

##### **PART B**

1. i) Discuss the factors to be considered in the selection of hydraulic fluids (8)  
ii) Explain the factors which affect the selection of pumps and discuss in detail the classification and performance features of different types of hydraulic fluids (8)
2. i) With neat sketch explain the hydraulic and pneumatic fluid power system (12)  
ii) Discuss the properties of the hydraulic fluids (4)
3. i) How to calculate frictional losses in common valve and fittings (8)  
ii) Define Reynolds number? (2)  
iii) Differentiate between laminar and turbulent fluid flow (6)
4. i) what are the advantages of oil hydraulic systems over other methods (4)  
ii) What are the desirable properties of hydraulic fluids? Discuss any eight of them in detail (12)
5. i) How is Reynolds number determined? (4)  
ii) Draw fluid power symbols of any six different types of valves? (12)
6. i) What is the basic consideration in the design of a hydraulic circuit (8)  
ii) Explain the hydraulic press circuit in detail (8)

## UNIT II HYDRAULIC SYSTEM AND COMPONENTS

### PART A

1. Name any four desirable characteristics of hydraulic pumps?
2. What are a positive displacement pump and a non-positive displacement pump?
3. Mention different types of pumps used in fluid power system?
4. List the factors to be considered in the pump selection?
5. What are pump characteristic curves? Draw the same for the positive displacement Pump.
6. Why end cushions are used in cylinders?
7. How do you select hydraulic pipes for a hydraulic system?

### PART B

1. i) What are the factors to be selected in selection of a pump for automobiles lift (8)  
ii) How will you measure the pump performance? explain each with suitable examples ? (8)
2. A pump has a displacement volume of  $98.4 \text{ cm}^3$  .It delivers  $0.00152 \text{ m}^3/\text{s}$  of oil at at 1000rpm and 70 bars. If the prime mover input torque is 124.3 N-m  
i)What is the overall efficiency of the pump ? (2)  
ii)What is the theoretical torque required to operate the pump ? (6)  
iii)What is cylinder cushioning? Explain with diagram (8)
3. A pump has a displacement volume of  $0.0819 \times 10^{-3} \text{ m}^3$  it delivers  $0.0758 \text{ m}^3/\text{min}$  at 1000rpm at 67 bar if the prime mover input torque is 100 N- m  
i)What is the overall efficiency (2)  
ii)What is the theoretical torque required to operate the pump (8)  
iii)Write short notes on variable displacement pumps (6)
4. (i)Explain the factors which affect the selection of pumps and discuss in detail the classification and performance features of different types of hydraulic pumps (8)  
(ii)Explain the construction and working of gear pump (8)
5. (i)Explain the working principle of external gear pump and determine its performance measures (10)  
(ii)Explain with a diagram the working of a telescopic cylinder (6)
6. (i)A gear pump has a displacement of  $60,000 \text{ m}^3$  .It delivers 100 liters per minute at 1440rpm and  $8 \text{ N/mm}^2$  .If the prime mover input torque is 75 N-m  
Find overall efficiency of the pump  
i)Theoretical torque required to operate the pump (8)  
ii)How the capacity of a variable displacement vane pump is is adjusted? explain with a diagram (8)
7. With a neat sketch explain the principle construction working advantages ,limitations and applications of a non-pressure compensated reciprocating vane pump (16)

**UNIT III      DESIGN OF HYDRAULIC CIRCUITS**  
**PART A**

1. What is a two way valve?
2. List any four types of pressure control valves
3. Differentiate between pressure reducing valve and pressure relief valve giving graphical symbol.
4. What are the different between pilot operated and direct operated pressure relief Valve?
5. What is the function of accumulator?
6. What is a combined flow control valve and check valve?
7. What are the function of reservoir?
8. What is the purpose of regenerative circuit?
9. Define 'pressure override' in pressure controls valves.
10. Highlight the need of using an accumulator in hydraulic circuits.
11. What is twin pressure valve?
12. What are the control functions of different valves in hydraulic systems?
13. What is a control valve?

**Part-B**

1. (i) With neat sketch describe the construction and operation of pressure regulated low control valve. (10)  
(ii) Explain the working of four way two position direction control valve . (6)
2. (i) Briefly explain any two type of accumulators. (8)  
(ii) Explain the working of four-way three position control valve (8)
3. (i) Explain the operational features of check valve with neat diagram. (5)  
(ii) Write short notes on shuttle valve (5)  
(iii) Which kind of accumulator operates at constant pressure? How can the pressure Changed? (6)
4. (i) Explain air over oil intensifier with suitable example. (10)  
(ii) With neat sketch Explain the weight loaded accumulator (6)
5. (i) Explain with a circuit how in shaping operation a fast approach, slow feed, and rapid return can be achieved. (8)  
(ii) Explain with a circuit how punching operation can be achieved (8)
6. (i) How does the pilot operated direction control valve function? Explain with neat diagram. (8)  
(ii) Discuss with neat diagram the working of non-return valve. (8)
7. Design a suitable circuit.  
(i) Two hydraulic cylinders two work in sequence. (8)  
(ii) An hydraulic cylinder is used for industrial application. It has been decided to use an accumulator as a leakage compensator. Design a circuit to fulfill these requirements. (8).

## UNIT IV PNEUMATIC SYSTEMS AND COMPONENTS

### PART A

1. Compare hydraulic and pneumatic circuit with respect to their characteristics?
2. What is the function of the bleed-off circuit?
3. What is the function of reservoir?
4. What is the air over oil intensifier?
5. What is meter-in circuit? What are its limitations?
6. What is meant by interlock contacts?
7. What is a relay?
8. Give the standard graphical symbol for FRL unit
9. What is the need of lubricator unit in the pneumatic system?
10. What are the reasons for pressure drop in pneumatic lines?
11. How are the air compressor classified?

### Part B

1. (i) Discuss the working principle of an air compressor (8)  
(ii) Discuss the function of the FRL unit (8)
2. (i) Explain the working of a pneumatic speed control circuit (8)  
(ii) What is the time delay circuit? Discuss with an example (8)
3. (i) Describe the operation of an FRL trio unit (8)  
(ii) Explain the ANSI symbols for all the types of actuators used in pneumatics, Quick exhaust valve and silencer (8)
4. (i) Highlight the advantages of an air over oil circuit and explain with suitable applications (8)  
(ii) Briefly explain on an electro hydraulic servo system used in industries (8)
5. What is compressor? Explain the working principle of piston type compressor with neat sketch (16)
6. What is the synchronizing? Explain the synchronizing circuit with suitable approaches? (16)
7. i) Draw the neat sketch of the pneumatic filter and explain its construction and working. Also give the graphical symbol (6)  
ii) Develop a continuous single cylinder reciprocation circuit for pneumatic system using limit switches and relays (10)
8. (i) Draw a neat sketch of an electro-hydraulic for sequencing drilling and clamping cylinders (10)  
(ii) Explain the working principle of any two types of pneumatic position serving devices? (6)
9. (i) Describe various pneumatic actuators with neat sketches? (4)  
(ii) Develop an electro pneumatic circuit for the following sequence A+B+A-B- where A & B stand for cylinder (+) indicates extension and (-) indicates retraction of cylinders (12)
10. Design an electro hydraulic circuit for the following sequences A+B+A-B- where A & B stand for cylinder (+) indicates extension and (-) indicates retraction of cylinders. Incorporate provision for auto-manual selector and emergency stop (16)
11. i) Explain with neat block diagram an air pilot control circuit for a double acting cylinder (8)  
ii) Describe any one of the electro-hydraulic circuits used in robotic system (8)

## **UNIT V      DESIGN OF PNEUMATIC CIRCUITS**

### **PART A**

1. What is meant by interlock contacts?
2. Mention any two roles of pneumatic systems in low cost automation?
3. What do you understand by single shot sequencing?
4. What is a power pack? what are the important components of a hydraulic power Pack?
5. How do microprocessors differ from PLCs?
6. Give the Harris formula used to determine the pressure drop in pipes for pneumatic Circuits.
7. What is a microprocessor?
8. What is servo valve? How does it work
9. Define coanda effect?
10. Define FLUIDICS?
11. What are the reasons for pressure drop in pneumatic lines?
12. Define the terms LAP and NULL with respect to servo valves
13. Differentiate between single stage and two stage servo valves
14. List major units of a PLC and the functions
15. List four types of faults and causes of hydraulic system break down
16. List types of faults that can be found in each of the components of a FRL unit

### **PART B**

1. i) Design of circuit with air pilot control of a double acting cylinder (8)  
ii) Explain with a circuit diagram how is the control of an air motor is achieved. A flow control valve used to adjust the speed of the motor (8)
2. i) What is the selection criterion for pneumatic components? (4)  
ii) What are the factors considered during the installation of pneumatic system? (6)  
iii) What are advantages of using fluidics system? (6)
3. Three pneumatic cylinders A, B, C are used in an automatic sequence of operation. A cylinder extends, B cylinder retracts C cylinder retracts and then A cylinder retracts C cylinder extends and B cylinder extends Develop pneumatic circuits by cascade Method. Sketch also travel step diagram and briefly explain. (16)
4. i) Briefly on the methodology adopted to install and maintain a pneumatic power Pack (10)  
ii) Write short notes on low cost automation (6)
5. Explain the hydro mechanical servo system with suitable application (16)
6. How the PLC is used in fluid power control Explain with suitable example (16)
7. i) Explain with block diagram the components present in a PLC and give their functions (8)  
ii) What is cascade control Explain giving suitable example circuit? (8)
8. i) Briefly explain the maintenance requirement for hydraulic power packs (6)  
ii) Explain the layout of pneumatic system with emphasis on sizing of conductors, cleanliness traps and pressure regulation (6)  
iii) Explain the principle of low cost automation (4)
9. i) What are PLC Explain their applications in low cost automation (8)  
ii) Give the procedure of the cascade method of designing sequencing circuit (8)
10. i) List out various operating problems associated with pumps and valves and the corresponding possible causes and suitable remedy for each problem (8)  
ii) Enunciate various criteria for the selection of pneumatic components (8)
11. i) What are the advantages of PLC? (4)  
ii) Explain the working principle of a PLC with neat block diagram (8)  
iii) How does a PLC differ from microprocessor? (4)