



KINGS

COLLEGE OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR 2011- 2012 / ODD SEMESTER



QUESTION BANK

SUB CODE & NAME : ME 1305 APPLIED HYDRAULICS & PNEUMATICS

YEAR/SEM : III/V

UNIT 1

FLUID POWER SYSTEMS AND FUNDAMENTALS

PART A (2Marks)

1. Define Hydraulics
2. What is a Fluid Power System?
3. Define Pascal's -Law4. What is the function of hydraulic actuator?
4. Define Viscosity .
5. List the application of fluid power system
6. What are the types of liquids used in hydraulic system?
7. What are the characteristic of gases?
8. What are the functions of hydraulic fluid?
9. What are the advantages of hydraulics system

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 2

HYDRAULIC SYSTEM AND COMPONENTS

PART A (2 Marks)

1. Define back Pressure.
2. Define Pump.
3. How pumps are classified?
4. Write about positive displacement pumps?
5. How gear pumps are classified?
6. Define Axial Piston pump & Radial Piston pump
7. Define Gear pump & Vane pump.
- 8 . Define Motor
- 9 Differentiate between liquid pressure and liquid flow rate?
10. How velocity of the hydraulic actuator is calculated?
11. State the Bernoulli's principle?
12. What are the factors to be considered for pump selection?

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 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 N/mm^2 .If the prime mover input torque is 75 N-m
- Find overall efficiency of the pump
- 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 3

DESIGN OF HYDRAULIC CIRCUITS

PART A (2 Marks)

1. Define Accumulator
2. What are the three basic types of accumulators used in hydraulic systems?
3. Name the two types of gas loaded accumulator?
4. Explain non-separator type gas loaded accumulator?
5. What are the three basic types of separator type gas loaded accumulator?
6. What are the most common applications of accumulators in hydraulic system?
7. What is the function of accumulator?
8. What are the conditions for the two cylinders to be synchronized?
9. What is pneumatic direction control valve?
10. What is the use of Time Delay Valves?
11. What is a fast exhaust valve?

Part-B

2. (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)**
3. (i) Briefly explain any two type of accumulators. **(8)**
(ii) Explain the working of four-way three position control valve **(8)**
4. (i) A hydraulic pump delivers at 60 bars, 120lpm into a circuit laid on a horizontal plane. There are 4 elbows ($k=0.75$), one globe valve fully open ($k=10$), and a direction control valve (pressure drop=3 bar) with the inside dia of the pipe is 30mm. The total length of the straight run pipe is 20m and the specific gravity of the oil is 0.9. The kinematics viscosity of oil is $.0001 \text{ m}^2/\text{s}$. Determine the pressure in bar at the exist point of the pipe **(10)**
(ii) How pressure relief valve and its variants could be used for unloading application **(6)**
5. (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)**

6. (i) Explain air over oil intensifier with suitable example. (10)
(ii) With neat sketch Explain the weight loaded accumulator (6)
7. (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)
8. (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)
9. 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 4

PNEUMATIC SYSTEMS AND COMPONENTS

PART A (2 Marks)

1. Name three speed control circuits?
2. What is the use of bleed-off circuit?
3. Name the important auxiliary components used in the hydraulic circuits?.
4. What are the factors to be considered while designing a hydraulic circuit?
5. What is the use of regenerative circuit?
6. What is automatic sequencing circuit?
7. What is a sequencing circuit?
8. Differentiate between hydraulic and pneumatic systems?
9. What is a fast exhaust valve?
10. What is the use of compressor?
11. Name two basic types of compressors?

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 $A+B+A^{\bar{}}B^{\bar{}}$ where A & B stand for cylinder (+) indicates extension and (-) indicates retraction of cylinders **(12)**

10. Design an electro hydraulic circuit for the following sequences $A+B+A^{\cdot}B^{\cdot}$ 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 5

DESIGN OF PNEUMATIC CIRCUITS

PART A (2 Marks)

1. What is ladder diagram?
2. What is the advantage of using micro electronic control for fluid power compared to electro mechanical control?
3. What is PLC?
4. What are the basic elements of PLC?
5. What is fluidics?
6. What are the advantages of fluidic elements?
7. Name the common methods used for designing logic circuits?
8. What is the difference between pressure switch and temperature switch?
9. How does a limit switch differ from a push button switch?
10. What is an electric relay?

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)**