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NEW SCHEME

Seventh Semester B.E. Degree Examination, May / June 2006
Mechanical Engineering
Hydraulics and Pneumatics

Time: 3 hrs.]

[Max. Marks:100

Note: 1. Answer any FIVE full questions.

2. Draw neat sketches wherever necessary.

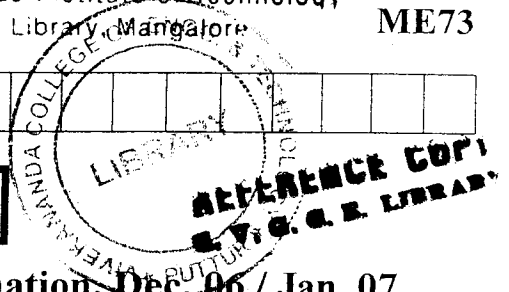
- 1 a. State Pascals Law. Explain briefly its applications. (06Marks)
b. With the aid of a neat sketch, explain the principle of operation of Internal gear pump. (08Marks)
c. Sketch and explain different types of vanes used in vane pumps. (06Marks)
- 2 a. Distinguish clearly between the following :
i. Tie rod cylinders and threaded head cylinders. (06Marks)
ii. Second class and Third class lever systems. (06Marks)
b. With the aid of an appropriate sketch, explain briefly the principle of operation of a Balanced Vane Motor. (10Marks)
c. Explain clearly the terms "Cracking pressure", "Full – flow pressure" and "pressure over – ride". (04Marks)
- 3 a. With the aid of neat sketches explain briefly the following:
i. In – line check Valve;
ii. Sequence Valve. (12Marks)
b. With the aid of an appropriate hydraulic circuit, explain the principle of operation of a counter balance circuit. (08Marks)
- 4 a. With the aid of suitable circuit, explain briefly the following:
i. Meter – in circuit and Meter – out circuit, (10Marks)
ii. Accumulator as a leakage compensator. (10Marks)
b. Explain briefly the principle involved in a regenerative circuit and obtain an expression for the regenerated speed of the actuator. (10Marks)
- 5 a. List the most common causes for the break down of a hydraulic system. (03Marks)
b. With the aid of suitable sketches, explain the following:
i. Return line filtering.
ii. Suction line filtering.
iii. Pressure line filtering. (09Marks)
c. List the various causes for the following troubles in a hydraulic system:
i. Noisy pump, ii. Over heating of hydraulic fluid, iii. No pressure in the working line, iv. Actuator fails to move. (08Marks)

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- 6 a. Give complete classification of pneumatic actuators. (03Marks)
b. Sketch and explain, a cushion assembly for a pneumatic cylinder. (07Marks)
c. With the aid of suitable sketches, explain briefly the following :
i. Open centre, ii. Closed centre, iii. Tandem centre configurations as applied to 3 - position - 4 - way valve. (10Marks)
- 7 a. Explain briefly the following:
i. .OR. Gate. ii. .AND. Gate. (06Marks)
b. Explain clearly the following as applied to electro - pneumatic controls:
i. Normally closed Relay switch.
ii. Normally open Relay switch. (04Marks)
c. Sketch and explain briefly the following:
i. Pneumatic pressure regulator.
ii. Air - Filter for pneumatic systems. (10Marks)
- 8 Write explanatory notes on the following :
a. Radial piston pump.
b. Factors to be considered for "seal" selection.
c. Accumulator as an emergency power source.
d. Hydraulic cylinder sequencing circuits. (20Marks)

USN

NEW SCHEME



Seventh Semester B.E. Degree Examination, Dec. 06 / Jan. 07
Mechanical Engineering
Hydraulics and Pneumatics

Time: 3 hrs.]

[Max. Marks:100

Note : 1. Answer any FIVE full questions.
 2. Draw neat sketches wherever necessary.

- 1 a. Name the six basic components required in a hydraulic circuit. (03 Marks)
 b. In the hydraulic press shown in Fig.1(b), a force of 100 N is exerted on the small piston. Determine the upward force on the large piston. The area of the small piston is $50 \times 10^2 \text{ mm}^2$ and the area of the large piston is $500 \times 10^2 \text{ mm}^2$. Also find the distance moved by the large piston if the small piston moves by 100 mm.

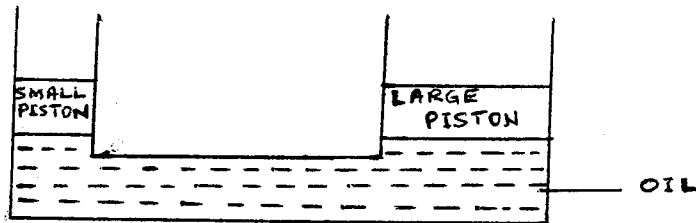


Fig.1(b)

- c. Explain the operation of a vane pump with a neat sketch. (07 Marks)
 (10 Marks)
 2 a. Explain the operation of a gear motor with a neat sketch. (08 Marks)
 b. A pump supplies oil at $0.0016 \text{ m}^3/\text{sec}$ to a 40 mm diameter double acting hydraulic cylinder. If the load is 5000 N (extending or retracting) and the rod diameter is 20 mm, find the
 i) Cylinder kW power during the extending stroke
 ii) Cylinder kW power during the retracting stroke. (05 Marks)
 c. A hydrostatic transmission, operating at 70 bars pressure has the following characteristics :

Pump	Motor
$V_D = 82 \text{ cm}^3$	-
$\eta_v = 82\%$	$\eta_v = 92\%$
$\eta_m = 88\%$	$\eta_m = 90\%$
$N = 500 \text{ rpm}$	$N = 400 \text{ rpm}$

Find the i) Displacement of the motor ii) Motor output torque. (07 Marks)

- 3 a. Explain simple pressure relief valve with a neat sketch. (08 Marks)
 b. A pressure relief valve has a pressure setting of 140 bars. Compute the kW power loss across the valve if it returns all the flow back to the tank from a $0.0016 \text{ m}^3/\text{sec}$ pump. (04 Marks)
 c. A double acting cylinder is hooked up in a regenerative circuit. The relief valve setting is 105 bars. The piston area is $130 \times 10^2 \text{ mm}^2$ and the rod area is $65 \times 10^2 \text{ mm}^2$. If the pump flow is $0.0016 \text{ m}^3/\text{sec}$, find the cylinder speed and load carrying capacity for the i) Extending stroke ii) Retracting stroke. (08 Marks)

Contd.... 2

- 4 a. Explain double-pump hydraulic system for a typical punch press application with the help of a neat hydraulic circuit. (10 Marks)
b. Explain spring loaded accumulator with a neat sketch. (05 Marks)
c. Explain with a neat hydraulic circuit the application of accumulator as an auxillary power source. (05 Marks)
- 5 a. Explain indirect control of a double acting pneumatic cylinder with a neat circuit diagram. (10 Marks)
b. A double-acting cylinder is to advance if one of two push buttons is operated. If the push button is then released, the cylinder is to retract - Draw a pneumatic circuit diagram using shuttle valve [logic OR] to perform the above operation. (10 Marks)
- 6 a. Explain supply air throttling and exhaust air throttling with the help of pneumatic circuit diagrams and mention their applications. (10 Marks)
b. A plastic component is embossed using a die powered by a double acting cylinder. Explain the above operation with a neat pneumatic circuit diagram involving a pressure sequence valve. (10 Marks)
- 7 a. Explain multi cylinder [two cylinder] control of pneumatic cylinders using a single reversing valve with a neat circuit diagram. The end positions of both cylinders should be sensed by limit switches. (12 Marks)
b. What are quick-exhaust valves? Explain the use of it in a single acting pneumatic cylinder with the help of a neat circuit diagram. (08 Marks)
- 8 Write explanatory notes on the following :
a. Sealing devices used in hydraulic systems
b. Dual pressure valve in pneumatic circuits
c. Time delay valves in pneumatic circuits
d. Control of hydraulic cylinder using single limit switch and ladder diagram. (20 Marks)



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NEW SCHEME

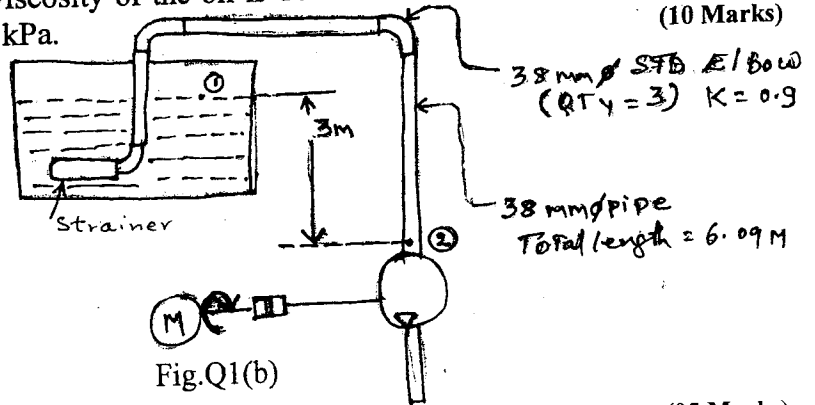
Seventh Semester B.E. Degree Examination, May 2007
Mechanical Engineering
Hydraulics and Pneumatics

[Max. Marks:100]

Time: 3 hrs.]

Note :1. Answer any FIVE full questions.**2. Write symbols to represent the parts while answering.**

- 1 a. Why is it important to select properly the size of pipes, valves and fittings in hydraulic systems? Discuss with suitable examples. (10 Marks)
- b. The oil tank for the hydraulic system of figure shown below is pressurized at 68 kPa gauge pressure. The inlet line to the pump is 3m below the oil level. The pump flow rate is $0.001896 \text{ m}^3/\text{sec}$. Find the pressure at station 2. The specific gravity of the oil is 0.90 and Kinematic viscosity of the oil is 100 cs. Assume that the pressure drop across the strainer is 6.9 kPa. (10 Marks)



- 2 a. Explain with a neat sketch working of linear actuators. (05 Marks)
- b. For a hydraulic motor define volumetric, mechanical and overall efficiency. (05 Marks)
- c. An 8 cm diameter hydraulic cylinder has a 4 cm diameter rod. If the cylinder receives flow at 100 LPM and 12 Mpa, find the
- Extension and retraction speeds. (10 Marks)
 - Extension and retraction load carrying capacities. (05 Marks)
- 3 a. Differentiate between a pressure relief valve and hydraulic fuse. (05 Marks)
- b. Name three ways in which directional control valves may be actuated. (05 Marks)
- c. Explain with neat sketch, how three way and four way direction control valves operate. (10 Marks)
- 4 a. Discuss the operation of hydraulic circuit with neat sketch that is generally used to prevent damage to the operator or damage to the equipment. (10 Marks)
- b. Explain with a neat circuit diagram the method followed to control the speed of piston in hydraulic cylinder. (10 Marks)
- 5 a. Differentiate between strainers and filters. Discuss the basic methods of filtering used in hydraulic circuits and how filters are rated. (10 Marks)
- b. Discuss the problems caused by the gases in hydraulic fluids. (05 Marks)
- c. List the probable causes for following types of troubles encountered in hydraulic circuits.
- Slow or erratic motion of actuator. (05 Marks)
 - Over heating of hydraulic fluid. (05 Marks)

Contd....2

- 6 a. Discuss operation of air filter with a neat sketch used in pneumatic circuits. (05 Marks)
 - b. Differentiate hydraulic and pneumatic systems. Sketch simple hydraulic and pneumatic systems. (10 Marks)
 - c. Discuss with suitable examples method employed to treat air before supplying it to pneumatic actuators. (05 Marks)
- 7 a. Explain with a neat circuit diagram, working of two-handed safety control system used in pneumatic circuits. (05 Marks)
 - b. With a neat sketch, explain how following functions are generated in pneumatic systems.
 - i) AND function
 - ii) OR function
 - iii) NOT function

(15 Marks)

- 8 a. Figure Q8(a) shows electrical control of regenerative circuit. Explain the working of the circuit. (10 Marks)

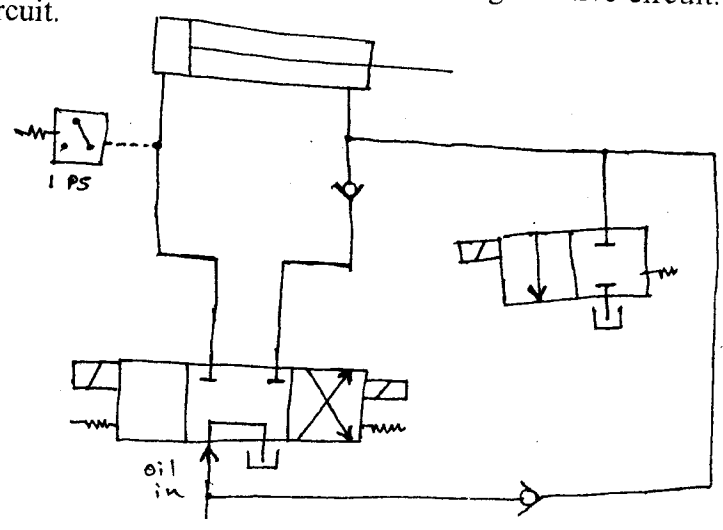


Fig.Q8(a)-1

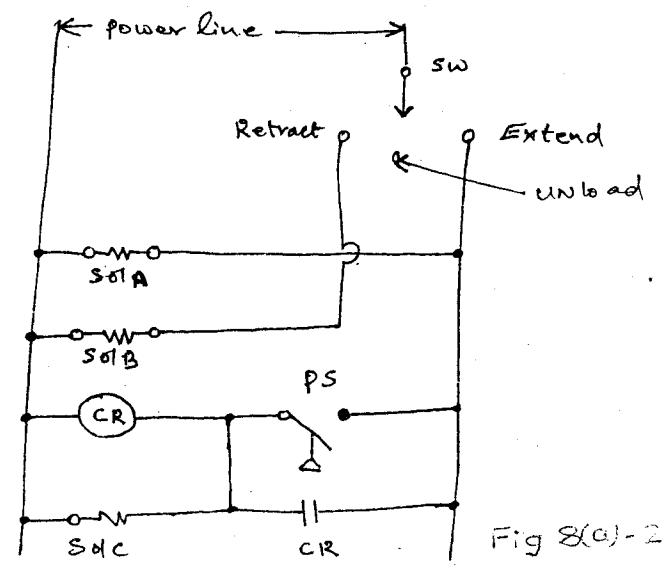
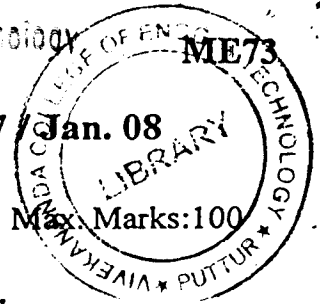


Fig 8(a)-2

- b. Discuss with neat sketch the distribution of compressed air in pneumatic systems. Explain the sub components that are used in compressed air distribution. (10 Marks)

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Seventh Semester B.E. Degree Examination, Dec. 07 / Jan. 08

Hydraulics and Pneumatics

Max. Marks: 100

- Note : 1. Answer any FIVE full questions.
2. Draw neat sketches wherever necessary.

State Pascal's law. Explain with neat sketch the basic hydraulic power system. (06 Marks)
Explain briefly various factors that influence the selection of pump for hydraulic system. (09 Marks)

A vane pump is to have a volumetric displacement of 82 cm^3 . It has a rotor diameter of 5.0 cm, a cam ring diameter of 7.5 cm and a vane width of 4.0 cm. What must be the eccentricity? (05 Marks)

- a. With a neat sketch explain second class lever system used with hydraulic cylinders to drive load. (06 Marks)
b. Explain with neat sketch the operation of swash plate piston motor in hydraulic system. (06 Marks)

c. A hydraulic motor has a displacement of $165 \text{ cm}^3/\text{rev}$ and operates with a pressure of 70 bars and a speed of 2000 rpm. If the actual flow rate consumed by the rotor is 6.0 lps and the actual torque delivered by the motor is 170 N-m. Find,
i) Volumetric efficiency ii) Mechanical efficiency and iii) Overall efficiency (08 Marks)

- a. Classify the control components used in hydraulics systems and name any six valve actuation symbols used in hydraulic system with simple sketch. (06 Marks)
b. Explain briefly with neat sketch the construction and operation of simple pressure relief valve. (07 Marks)
c. Explain briefly with neat sketch the working of pressure compensated flow control valve used in hydraulic system. (07 Marks)

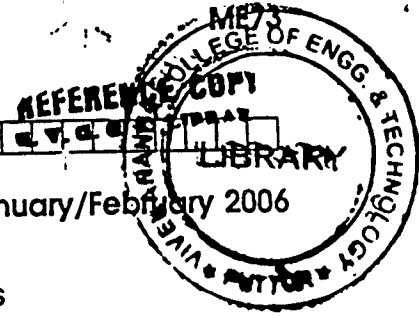
- a. With the help of neat circuit diagram explain briefly the 4-way control system for double acting cylinder. (08 Marks)
b. Explain briefly with neat sketch the cylinder synchronizing circuit operated together with a pair of cylinders in series in a synchronized manner to lift the load. (08 Marks)
c. What are hydraulic accumulators? Classify the different accumulators used in hydraulic system. (04 Marks)

- a. What are the desirable properties of hydraulic fluids? Explain briefly any five of them. (10 Marks)
b. What are the functions of reservoir system? Explain briefly with neat sketch construction features of a hydraulic reservoir. (10 Marks)

- a. For continuous rotation with neat sketch explain briefly turbine type air motor which is used as a pneumatic actuator. (05 Marks)
b. Discuss advantages of air motors compared to electric and hydraulic motors. (08 Marks)
c. Explain briefly with neat sketch $\frac{3}{2}$ way spool type directional control valve to control the flow of air in pneumatic system. (07 Marks)

- a. Explain briefly with neat sketch, construction and principle of operation of a typical quick exhaust valve, to increase the actuation speed of a cylinder in pneumatic system. (07 Marks)
b. Discuss advantages of pneumatic logic devices over electrical logic devices. (06 Marks)
c. Explain a typical pneumatic circuit based on AND logic function using a two-pressure valve, with a neat circuit. (07 Marks)

- a. Draw and explain briefly a typical two-cylinder pneumatic circuit to control its motion in a pneumatic system. (07 Marks)
b. Define and explain the operation of solenoids used in pneumatic system with neat sketch. (06 Marks)
c. Classify compressors of pneumatic system. Explain briefly the diaphragm compressor. (07 Marks)



Seventh Semester B.E. Degree Examination, January/February 2006
 Mechanical Engineering
 Hydraulics and Pneumatics

Time: 3 hrs.)

(Max.Marks : 100)

Note: Answer any FIVE full questions.

1. (a) List six basic components required in a hydraulic fluid power system and state their essential functions. (6 Marks)
- (b) State five disadvantages of using air instead of hydraulic oil in a fluid power system. (5 Marks)
- (c) In the hydraulic device shown in fig. (1c), calculate the output torque T_2 , if the input torque $T_1 = 10 N.cm$

given :

- Radius $R_1 = 2cm$
 Diameter $d_1 = 8cm$
 Radius $R_2 = 4cm$
 Diameter $d_2 = 24cm$

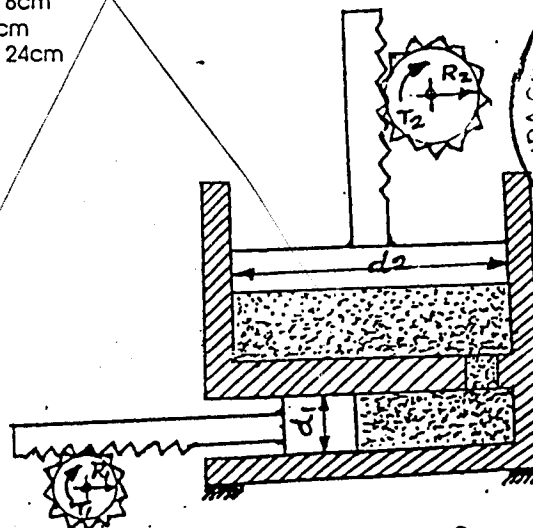


Fig.(1c)

2. (a) Using a neat diagram, explain the construction and functioning of a simple, fixed displacement hydraulic vane pump. (8 Marks)
- (b) Briefly state how this vane pump can be made to work as a variable displacement pump without changing the speed of the prime-mover. (4 Marks)

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Seventh Semester B.E. Degree Examination, Dec.08/Jan.09

Hydraulics and Pneumatics

Time: 3 hrs.

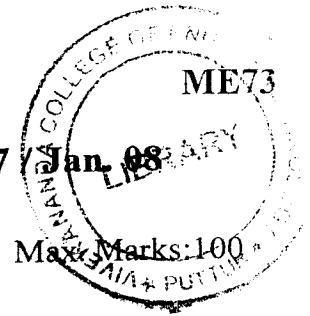
Max. Marks:100

Note: Answer any FIVE full questions.

- 1 a. Explain the working of a hydraulic jack using Pascal's law. (08 Marks)
b. Explain the role of a pump in a hydraulic system. (06 Marks)
c. A vane pump has a rotor diameter of 60mm, a cam ring diameter of 90mm and a vane width of 50mm. If the eccentricity is 10mm, determine the volumetric displacement. (06 Marks)
- 2 a. Discuss with a neat sketch, the working of a swash plate type axial piston pump. (08 Marks)
b. Explain the "End cushion" provided in hydraulic cylinder with a neat sketch. (06 Marks)
c. A single-vane rotary actuator has the following data:
Outside radius of rotor = 12 mm; Outer radius of vane = 38mm, width of vane = 25mm, Hydraulic pressure developed = 70 bar. Find
(i) The hydraulic force acting on the vane.
(ii) The torque generating capacity of the rotary actuator. (06 Marks)
- 3 a. Differentiate between:
(i) Poppet type DCV and sliding spool type DCV.
(ii) Check valve and pilot operated check valve. (08 Marks)
b. Explain the working principles of the following along with their symbols: (08 Marks)
(i) Sequence valves.
(ii) Counter balance valves
c. Write a note on needle flow control valve. (04 Marks)
- 4 a. Explain with suitable circuits, how the single acting and double acting hydraulic cylinders are controlled. (10 Marks)
b. Design and explain the hydraulic power circuit for sequencing of the following operations in a drilling machine. (10 Marks)
(i) Clamping the work piece.
(ii) Drilling the work piece.
(iii) Unclamping the work piece.
- 5 a. Explain with the help of a hydraulic circuit, how the cylinder speed can be controlled by metering out oil from the cylinder. (08 Marks)
b. Compare a dead weight type accumulator with a spring loaded type accumulator. Explain their merits and demerits. (08 Marks)
c. Derive an equation for Beta efficiency. (04 Marks)
- 6 a. Differentiate between the following: (08 Marks)
(i) Single acting and Double acting pneumatic cylinder. (ii) Air motor and Air cylinder.
b. Explain with a neat sketch, the working of valve seat type four way, two position direction control valve. (08 Marks)
c. Write a note on cylinder mountings. (04 Marks)
- 7 a. What do you mean by Quick exhaust valve? Explain its working principle with a sketch. (10 Marks)
b. Explain with a pneumatic circuit, the control of extension of a double acting cylinder using OR and AND logic gates. (10 Marks)
- 8 Write short notes on any FOUR of following: (20 Marks)
a. Accumulator as an emergency power source.
b. Pump characteristic curves.
c. Filters and Strainers
d. Electro-pneumatic control
e. Pneumatic pressure regulator.

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Seventh Semester B.E. Degree Examination, Dec. 07/Jan. 08

Hydraulics and Pneumatics

Time: 3 hrs.

Note :1. Answer any FIVE full questions.**2. Draw neat sketches wherever necessary.**

- 1
 - a. State Pascal's law. Explain with neat sketch the basic hydraulic power system. (06 Marks)
 - b. Explain briefly various factors that influence the selection of pump for hydraulic system. (09 Marks)
 - c. A vane pump is to have a volumetric displacement of 82 cm^3 . It has a rotor diameter of 5.0 cm, a cam ring diameter of 7.5 cm and a vane width of 4.0 cm. What must be the eccentricity? (05 Marks)
- 2
 - a. With a neat sketch explain second class lever system used with hydraulic cylinders to drive load. (06 Marks)
 - b. Explain with neat sketch the operation of swash plate piston motor in hydraulic system. (06 Marks)
 - c. A hydraulic motor has a displacement of $165 \text{ cm}^3/\text{rev}$ and operates with a pressure of 70 bars and a speed of 2000 rpm. If the actual flow rate consumed by the rotor is 6.0 lps and the actual torque delivered by the motor is 170 N-m. Find,
 - i) Volumetric efficiency
 - ii) Mechanical efficiency and
 - iii) Overall efficiency (08 Marks)
- 3
 - a. Classify the control components used in hydraulics systems and name any six valve actuation symbols used in hydraulic system with simple sketch. (06 Marks)
 - b. Explain briefly with neat sketch the construction and operation of simple pressure relief valve. (07 Marks)
 - c. Explain briefly with neat sketch the working of pressure compensated flow control valve used in hydraulic system. (07 Marks)
- 4
 - a. With the help of neat circuit diagram explain briefly the 4-way control system for double acting cylinder. (08 Marks)
 - b. Explain, briefly with neat sketch the cylinder synchronizing circuit operated together with a pair of cylinders in series in a synchronized manner to lift the load. (08 Marks)
 - c. What are hydraulic accumulators? Classify the different accumulators used in hydraulic system. (04 Marks)
- 5
 - a. What are the desirable properties of hydraulic fluids? Explain briefly any five of them. (10 Marks)
 - b. What are the functions of reservoir system? Explain briefly with neat sketch construction features of a hydraulic reservoir. (10 Marks)
- 6
 - a. For continuous rotation with neat sketch explain briefly turbine type air motor which is used as a pneumatic actuator. (05 Marks)
 - b. Discuss advantages of air motors compared to electric and hydraulic motors. (08 Marks)
 - c. Explain briefly with neat sketch $\frac{3}{2}$ way spool type directional control valve to control the flow of air in pneumatic system. (07 Marks)
- 7
 - a. Explain briefly with neat sketch, construction and principle of operation of a typical quick exhaust valve, to increase the actuation speed of a cylinder in pneumatic system. (07 Marks)
 - b. Discuss advantages of pneumatic logic devices over electrical logic devices. (06 Marks)
 - c. Explain a typical pneumatic circuit based on AND logic function using a two-pressure valve, with a neat circuit. (07 Marks)
- 8
 - a. Draw and explain briefly a typical two-cylinder pneumatic circuit to control its motion in a pneumatic system. (07 Marks)
 - b. Define and explain the operation of solenoids used in pneumatic system with neat sketch. (06 Marks)
 - c. Classify compressors of pneumatic system. Explain briefly the diaphragm compressor. (07 Marks)

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06ME82

Eighth Semester B.E. Degree Examination, May/June 2010
Hydraulics and Pneumatics

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. What are the important considerations when selecting a pump for a particular application? Explain. (06 Marks)
 - b. A displacement type cylinder has a rod of 65 mm diameter and is powered by hand pump with a displacement of 5 ml per double stroke. The maximum operating pressure of the system is to be limited to 350 bar. Calculate :
 - i) The number of double pumping strokes needed to extend cylinder rod by 50 mm.
 - ii) The maximum load which could be raised, using this system. (06 Marks)
 - c. A hydraulic motor has a displacement of 130 cm³, operates with a pressure of 105 bar and has a speed of 2000 rpm. If the actual flow rate consumed by the motor is 0.005 m³/s and the actual torque delivered by the motor is 200 N-m, find :
 - i) Volumetric efficiency
 - ii) Mechanical efficiency
 - iii) Overall efficiency
 - iv) Power delivered by motor in kW. (08 Marks)
-
- 2 a. Explain with a neat sketch, the working of a balanced vane motor. (06 Marks)
 - b. Find the flow rate in Lpm that an axis piston pump delivers at 1200 rpm. The pump has 12, 15 mm diameter pistons arranged on an 120 mm piston circle diameter. The offset is set 10°, and volumetric efficiency is 94%. (06 Marks)
 - c. A pump is operating at 75.7 Lpm and 12400 kPa. It has an overall efficiency of 0.83. It is driven by an electric motor with an efficiency of 0.87. How much power in kW is the electric motor drawing? (08 Marks)
-
- 3 a. Explain the working of a pressure reducing valve, with a neat sketch. (06 Marks)
 - b. Explain any four center configurations in three position, four way D.C. valve. (06 Marks)
 - c. Draw ISO symbolic representation of
 - i) Pressure sequence valve
 - ii) Pressure reducing valve
 - iii) Pressure relief valve
 - iv) Manually operated spring centered, 3 position four way valve. (08 Marks)
-
- 4 a. Draw the hydraulic circuit diagram of regenerative cylinder operation and obtain an expression for the regenerated speed of the actuator. (10 Marks)
 - b. Explain with a hydraulic circuit :
 - i) The application of accumulator as an emergency power source
 - ii) Meter – in and meter – out circuit. (10 Marks)

PART – B

- 5 a. What do you mean by beta ratio and beta efficiency? (04 Marks)
- b. What are the probable causes for the following troubles in an hydraulic system?
- i) Noisy pump
 - ii) No pressure
 - iii) Actuator failure
 - iv) Overheating of hydraulic fluid. (08 Marks)
- c. Explain the four different types of fire resistant fluids in common use. (08 Marks)
- 6 a. Give complete classification of pneumatic actuators. (06 Marks)
- b. Name three reasons for considering the use of pneumatics instead of hydraulics. (06 Marks)
- c. Explain end cushion arrangement in double acting cylinder, with a neat sketch. (08 Marks)
- 7 a. How following functions are generated in pneumatic systems? Explain with a sketch.
- i) AND
 - ii) OR
 - iii) NOT. (15 Marks)
- b. Explain with a suitable circuit diagram, application of the memory valve. (05 Marks)
- 8 a. Explain the following as applied to electro-pneumatic controls.
- i) Normally closed relay switch.
 - ii) Normally open relay switch. (04 Marks)
- b. Sketch a circuit to control two pneumatic cylinders using limit switch for sequential motion. (10 Marks)
- c. Explain air filter for pneumatic system, with a neat sketch. (06 Marks)

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