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10ME73

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
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. Explain the structure of a hydraulic system and its components with a block diagram. (06 Marks)
b. Explain the construction and working of external gear pump with a neat sketch. Write the expression for volumetric displacement of the pump. (06 Marks)
c. The pump has a displacement volume of 100 cm^3 . It delivers $0.0015 \text{ m}^3/\text{s}$ at 1000 rpm and 70 bars. If the prime mover input is 120 N-m. The pump is driven by the electric motor having an overall efficiency of 85%. The hydraulic system operates at 12 hours per day for 250 days per year. The cost of electricity is Rs.1.1 per KWhr. Determine:
(i) What is the overall efficiency of the pump?
(ii) What is the theoretical torque required to operate the pump?
(iii) The yearly cost of electricity required to operate the hydraulic system.
(iv) The amount of electricity that is due to the inefficiencies of electric motor and pump. (08 Marks)
- 2 a. Sketch and explain balanced vane motor. (06 Marks)
b. Explain the second class lever system with a neat sketch. (06 Marks)
c. A hydraulic motor has a displacement of 164 cm^3 and operates with a pressure of 70 bars and a speed of 2000 rpm. If the actual flow rate consumed by the motor is $0.006 \text{ m}^3/\text{s}$ and the actual torque delivered by the motor is 170 N-m. Find:
(i) Volumetric efficiency
(ii) Mechanical efficiency
(iii) Overall efficiency
(iv) The actual KW delivered by the motor. (08 Marks)
- 3 a. Classify hydraulic control valves. Write the symbolic representation of different types of valves. (10 Marks)
b. Explain with a neat sketch the solenoid actuated valve. (07 Marks)
c. Briefly explain the needle valve with sketch and symbolic representation. (03 Marks)
- 4 a. What are regenerative circuits? Write the regenerative circuit to increase the extension speed of a double acting cylinder. (06 Marks)
b. Explain with a neat circuit diagram, meter-in and meter-out. (10 Marks)
c. With neat circuit diagram, explain accumulator used as hydraulic shock absorber. (04 Marks)

PART – B

- 5 a. Write a note on different types of filters and the location of filters in hydraulic circuit. (07 Marks)
b. Explain, what are the desirable properties of hydraulic oils. (08 Marks)
c. With neat sketches, explain reservoir in hydraulic system. (05 Marks)

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- 6 a. What are the advantages and disadvantages of pneumatic system? (08 Marks)
b. Sketch and explain rodless cylinder. (06 Marks)
c. Explain with neat sketch end cushion arrangement in double acting cylinder. (06 Marks)
- 7 a. Explain the pneumatic circuit with OR logic using shuttle valve. (10 Marks)
b. Explain indirect or pilot control of double acting pneumatic cylinder with circuit diagram. (10 Marks)
- 8 a. List different types of compressors. Explain any one type of compressor used to produce compressed air. (09 Marks)
b. Write a note on sealing devices. (05 Marks)
c. Explain the principle of cascade control. (06 Marks)

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