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Fifth Semester B.Tech. Degree Examination, Jan./Feb. 2023

Hydraulics and Pneumatics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What are the main components of hydraulic system? Write with neat sketch, explain hydraulic system. (10 Marks)
- b. State Pascal's law and explain with a neat sketch its applications to simple hydraulic jack. (10 Marks)

OR

- 2 a. Sketch and explain the construction and working of external gear pump giving expressions for volumetric displacement and theoretical flow rate. (10 Marks)
- b. A pump having a displacement of $14 \text{ cm}^3/\text{rev}$ is driven at 1440 rpm and operates against a maximum pressure of 150 bar. The volumetric efficiency is 0.9 and the overall efficiency is 0.80. Calculate
- (i) Pump delivery in LPM.
- (ii) The input power required in kW. (10 Marks)

Module-2

- 3 a. What is an actuator? How are they classified? Explain one of them with sketch. (10 Marks)
- b. A hydraulic motor has a displacement of 164 cm^3 and operates with a pressure of 70 bar 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 Nm. Find,
- (i) Volumetric efficiency (η_v).
- (ii) Mechanical efficiency (η_m)
- (iii) Actual power delivered by motor. (10 Marks)

OR

- 4 a. Explain briefly the construction, working principle along with graphic symbol of the following : (i) Sequencing valve (ii) Counter balance valve. (12 Marks)
- b. Explain with a neat sketch, the principle of working of a pilot operated pressure relief valve. Also draw the graphic symbol for the valve. (08 Marks)

Module-3

- 5 a. Explain with a neat sketch regenerative circuit. (10 Marks)
- b. Explain with a neat sketch double pump hydraulic circuit. (10 Marks)

OR

- 6 a. What are the desirable properties of hydraulic fluids? Explain briefly. (08 Marks)
- b. What do you mean by static and dynamic seal? Mention sealing materials used. (06 Marks)
- c. Explain the various filter locations used in filtering in hydraulic systems. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. What are the advantages, limitations and applications of pneumatic system? (08 Marks)
b. Explain the characteristics of compressed air. (06 Marks)
c. Briefly explain FRL unit with a neat sketch. (06 Marks)

OR

- 8 a. Explain the working of single vane rotary cylinder with a suitable sketch. (06 Marks)
b. With a neat sketch the construction and working principles of pneumatic lubricator. (08 Marks)
c. Brief the working of quick exhaust valve. (06 Marks)

Module-5

- 9 a. Explain the controlling of double acting pneumatic cylinder using solenoid operated directional valve with a circuit. (10 Marks)
b. With a suitable pneumatic circuit, explain the indirect actuation of double acting cylinder using memory valve. (10 Marks)

OR

- 10 a. Explain the use of relays in electro-pneumatic control with neat sketch. (06 Marks)
b. With a neat sketch, explain coordinated sequence motion of two cylinders. (08 Marks)
c. Explain the principle of cascade control system. (06 Marks)

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