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15ME72

## Seventh Semester B.E Degree Examination, Feb./Mar.2022 Fluid Power Systems

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. State Pascal's law. Explain with a neat sketch the application of Pascal's law in a hydraulic jack. (08 Marks)
- b. Explain the following:
  - (i) Filters.
  - (ii) Seals.
  - (iii) Additives.
  - (iv) Contaminants and sources of contaminants (08 Marks)

**OR**

- 2 a. Explain with neat diagram the components of fluid power system. List its advantages and applications. (08 Marks)
- b. Explain important functions of fluids for hydraulic system and its types. (04 Marks)
- c. List the properties of hydraulic fluids and explain any four. (04 Marks)

### Module-2

- 3 a. How are hydraulic pumps classified? What are positive displacement pumps? (02 Marks)
- b. Explain with neat sketch the construction and working of an external gear pump. (06 Marks)
- c. A double acting cylinder has a bore of 80 mm and piston rod diameter of 40 mm and a stroke length of 160 mm. If the cylinder is used to push a load of 15 kN and the discharge of the pump is 15 cm<sup>3</sup>/min. Calculate :
  - (i) System pressure, P
  - (ii) Pulling or retracting force, F.
  - (iii) Extension speed, V<sub>e</sub>
  - (iv) Retraction speed, V<sub>r</sub>.
  - (v) Extension power, P<sub>e</sub>
  - (vi) Flow rate, Q<sub>F</sub>. (08 Marks)

**OR**

- 4 a. Explain with neat sketch construction and working of variable displacement axial piston motor to develop power, P. (08 Marks)
- b. A hydraulic transmission operating at 100 bars pressure has the following characteristics:

Hydraulic pump	Hydraulic motor
$V_D = 100 \text{ cm}^3$	$V_D = ?$
$\eta_{\text{vol}} = 90\%$	$\eta_{\text{vol}} = 92\%$
$\eta_{\text{mech}} = 85\%$	$\eta_{\text{mech}} = 87\%$
$N = 1500 \text{ rpm}$	$N = 700 \text{ rpm}$

Find : (i) Displacement

(ii) Output torque of motor.

(08 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-3**

- 5 a. Explain with neat sketch the operation of compound pressure relief valve. Also write its graphic symbol. (06 Marks)
- b. Write graphic symbols for :
- (i) 4/3 pilot operated DCV
  - (ii) Counter balance valve. (02 Marks)
- c. Explain how speed control of hydraulic cylinder done in meter-in and meter-out circuits with neat diagrams. (08 Marks)

**OR**

- 6 a. Explain with neat circuit diagram the operation for sequencing of two cylinders for a machining operation. (08 Marks)
- b. Explain with neat circuit diagram, the cylinder synchronizing circuits in series and parallel. (08 Marks)

**Module-4**

- 7 a. Explain briefly with neat sketches:
- (i) Time delay valve
  - (ii) Twin pressure valve,
- Also write graphic symbols for each. (08 Marks)
- b. Explain fluid conditioning with a neat block diagram. (04 Marks)
- c. Explain with sketches :
- (i) Air dryers.
  - (ii) FRL unit. (04 Marks)

**OR**

- 8 a. Explain with neat sketch Quick exhaust valve to increase the speed of pneumatic cylinder. Also write its graphic symbol. (08 Marks)
- b. How are pneumatic actuators classified? Explain the operation of any two types of pneumatic actuators with sketches. (08 Marks)

**Module-5**

- 9 a. What is a pilot valve? Explain the control of extension of a double acting cylinder using logic gates with neat circuit diagram. (08 Marks)
- b. Explain with a neat diagram the coordinated sequence motion of two cylinders using memory valve. (08 Marks)

**OR**

- 10 a. Explain with neat circuit diagram, signal elimination by reversing valves using cascading method. (08 Marks)
- b. Explain with neat sketches pressure dependent control with and without using limit switch. (08 Marks)

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