

M.E. / M.TECH. DEGREE EXAMINATIONS, DEC 2020 (Held during April, 2021)

First Semester

MS18105 – Drives and Actuators for Automation

(Mechatronics)

(Regulation 2018)

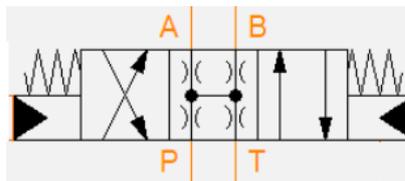
Time: Three Hours

Maximum : 80 Marks

Answer ALL questions

PART A - (8 X 2 = 16 Marks)

1. Major function of hydraulic oil is to lubricate the components – TRUE/FALSE.
2. Which of the following is positive displacement pump?
 - i) External Gear pump
 - ii) Internal Gear pump
 - iii) Vane pump
 - iv) All of the above
3. Choose the correct statement
 - i) Flow control valve is used to control the speed of the actuators
 - ii) Pressure control valve is used to control the force exerted by actuators
 - iii) Directional control valve is used to change the direction of actuators
 - iv) All of the above are true.
4. The following is the ANSI symbol for 3/2 pilot operated DCV – TRUE/FALSE.



5. PLC can be used to control both hydraulic and pneumatic systems – TRUE/FALSE.
6. Differentiate between cascade and Karnaugh map methods of circuit design.
7. Distinguish between A.C & D.C motors.
8. Brief about hybrid actuators.

PART B - (4 X16 = 64 marks)

9. (a) (i) Discuss the different hydraulic fluids and their important properties. **(8)**
 - (ii) The kinematic viscosity of a hydraulic fluid is $0.0001 \text{ m}^2/\text{s}$. If it is flowing in a 30-mm diameter pipe at a velocity of 6 m/s, find the head loss due to friction in units of bars for a 100-m smooth pipe. The oil has a specific gravity of 0.90. **(8)**
- (OR)**
- (b) (i) Draw the neat sketch and explain the construction, working principle & characteristics of pressure compensated vane pump. **(12)**

- (ii) A gear pump has 75mm outside diameter, a 60mm inside diameter and a 20mm width. If the actual pump flow at 1800rpm and rated pressure is $0.16\text{m}^3/\text{min}$, what is the volumetric efficiency? (4)

10. (a) (i) Pressure unloading valve is used to unload the discharge of the pump – TRUE/FALSE. Justify your answer with neat diagram and explanation. (12)
- (ii) Distinguish meter-in and meter-out circuits used to control the speed of actuators. (4)

(OR)

- (b) (i) Draw the ANSI symbol for (8)
- I) FCV
 - II) Pressure reducing valve
 - III) Pressure relief valve
 - IV) 4/2 push button operated spring return DCV.
- (ii) Explain how the pressure sequence valve is used for performing bending operation with suitable hydraulic circuit diagram. (8)

11. (a) Design and explain the hydraulic cascade sequencing circuit ($A^+ B^+ B^-$ & A^-) for performing clamping and pressing operations with the help of pilot operated hydraulic valves. (16)

(OR)

- (b) (i) Design meter-out hydraulic circuit to control both the extension and retraction speed of double acting cylinder and explain the working principle. (8)
- (ii) Explain the function of PLC in hydraulic system with suitable example. (8)

12. (a) (i) Explain the working principle and characteristics of D.C Motor with neat diagram. (12)
- (ii) Briefly discuss about piezo electric actuators. (4)

(OR)

- (b) (i) With neat sketch explain the drive circuits used for controlling the speed and position of stepper motor. (12)
- (ii) Distinguish between linear and rotary actuators. (4)