Bachelor of Engineering (Mechanical Engineering) - Fourth Year - Second Semester, 2023 (Suppl.)

Subject: Electrohydraulic Control Systems

Time : Three hours **Full Marks: 100**

*Answer any **five** questions*

1. Justify the following statements: **[5×4]**

(a) Positive displacements pumps are preferred over rotodynamic pumps in case of fluid power applications.

(b) The same spool valve with metered ports, which is used in a circuit with a symmetric actuator, can be used for the case of an asymmetric actuator as well without any difficulties.

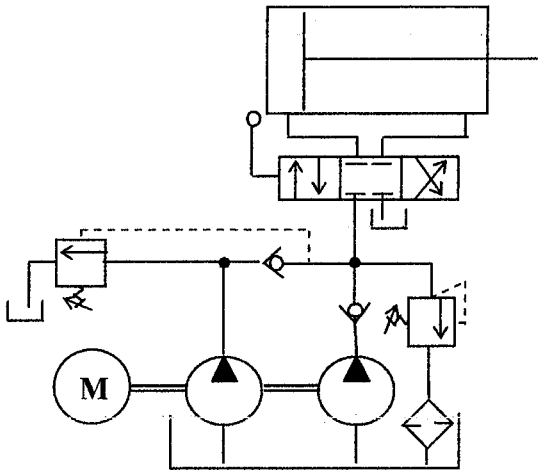
(c) An intensifier should have at least three ports attached to it.

(d) A regenerative circuit cannot be constructed with a symmetric actuator.

2. (a) Explain the function of a pressure-compensated flow control valve with a neat sketch and explain its advantage over a simple flow control valve. **[12]**

(b) Explain the operation of a variable displacement swash plate axial piston pump. **[08]**

3. (a) Explain explicitly every symbol of the circuit shown in the figure. Identify the circuit and explain its working principal. **[14]**



(b) Discuss the role of an *accumulator* in a fluid power circuit. **[6]**

4. (a) Obtain an expression of efficiency for a meter-out circuit. Why is it preferred over meter-in and bleeder circuits? **[10]**

(b) Briefly describe the operation of an *counterbalance* circuit, as used in a fluid power system, with the help of a neat sketch. **[10]**

5. (a) For the system with transfer function $G(s) = (s+1)/ (s^2+7s+10)$, what are the poles and zeroes. Indicate them in the Argand diagram and comment on the stability of the system. Which one is the dominant pole? Explain why it is so called.

(b) Discuss about the relative advantage of a PI controller over a P controller. **[12+8]**

6.(a) Briefly describe the operation of an *intensifier* circuit, as used in a fluid power system, with the help of a neat sketch.

(b) Using *Routh's Criteria,* comment on stability of the system with characteristic equation

$$s^4+s^3+2s^2+2s+5=0\,.$$ **[10+10]**