B.E. Mechanical Engineering (Part Time) - Fourth Year - Second Semester, 2018

Subject: Electrohydraulic Control Systems

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

Answer any five [5].

1. (a) Why positive displacements pumps are preferred over rotodynamic pumps in case of fluid power applications?

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

   (c) Explain the operation of a fixed displacement type vane pump.

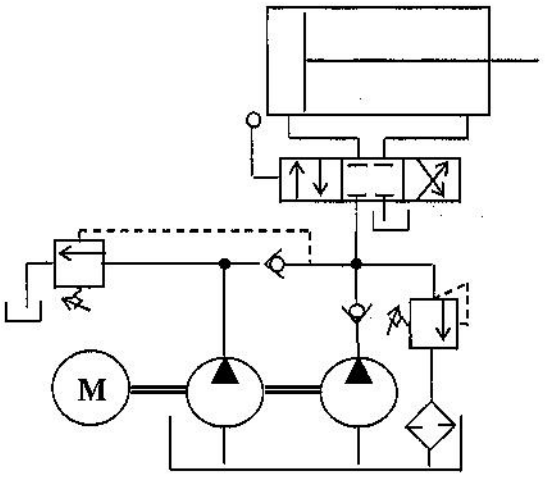
   (d) Can a regenerative circuit be constructed with a symmetric actuator? Explain.

   (e) What is a tandem-centered Direction Control Valve? **[5×4]**

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

   (b) A hydraulic actuator (piston diameter 150 mm; rod diameter 55 mm) is connected regeneratively for the part of the working stroke. The pump supply is 25 lpm at 100 bar. Calculate the normal and regenerative speeds and thrust in both directions. Determine the regenerative flow also. **[10+10]**

3. (a) Explain explicitly every symbol of the circuit shown in the figure. Identify the circuit and explain its working principal. **[12]**



   (b) Explain the function of a pressure-compensated flow control valve with a neat sketch and explain its advantage over a simple flow control valve. **[8]**

4. (a) Obtain an expression of efficiency for a meter-out circuit. Why is it preferred over meter-in circuits?

(b) With a neat sketch, describe the operation of a sequencing circuit. **[10+10]**

5. (a) For the system with transfer function $G(s) = C(s)/R(s) = 2(s^2+9s+19)/ (s^2+17s+30)$, what are the poles and zeroes. Indicate them in the Argand diagram and comment on the stability of the system.

(b) For the above system draw the bode plot for amplitude. **[08+12]**

6. (a) State the main drawback of a P-controller and explain how the same can be overcome.

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

$$s^4+s^3+2s^2+2s+5=0.$$ **[08+12]**