

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2021

Course: Hydraulics & Pneumatics
Program: B.Tech Mechatronics
Course Code: MECH3021

Semester: VI
Time: 03 hrs.
Max. Marks: 100

Instructions:

SECTION A

S. No.		Marks	CO
Q 1	List the difference between hydraulics and pneumatics system.	5	CO1
Q 2	List the primary function of hydraulics & pneumatic circuit.	5	CO1
Q 3	Define cavitation in pump.	5	CO2
Q 4	Classify different types of hydraulic control valves.	5	CO2
Q5	List the primary function of hydraulic fluid .	5	CO3
Q6	Define the viscosity index and comment out on its importance in the hydraulic circuit.	5	CO3

SECTION B

Q 1	(a) A vane pump is to have a volumetric displacement 115 cm^3 . It has a rotor diameter of 63.5 mm, a cam ring of 88.9 mm, and a vane width of 50.8 mm. What must be eccentricity? (b) What is the theoretical flow rate from a fixed displacement, axial piston pump with a nine-bore cylinder operating at 2000rpm? Each bore has a 15 mm diameter and the stroke is 20 mm.	10	CO2
Q 2	Describe the construction and working of the hydraulic shock absorber and hydraulic cylinder cushions.	10	CO3
Q3	A pressure relief valve contains a poppet with a 4.20 cm^2 area on which system pressure acts. During the assembly, a spring with a spring constant of 3200 N/cm is installed in the valve to hold the poppet against its seat. The adjustment mechanism is then set so that the spring is initially compressed 0.50 cm from its free length condition. In order to pass full pump flow through the valve at the PRV pressure setting, the poppet must move 0.30 cm from its fully closed position. Determine the	10	CO4

	(a) Cracking pressure (b) Full pump flow pressure		
Q 4	Explain the constructional features of the following hydraulic valve: (a) Sequential Valve (b) Counterbalance valve	10	CO4
Q5	Sketch the hydraulic circuit for the hydraulic drilling operation. When the directional control valve in the system return to its center position, the cylinder rod moves in a given direction. Is this direction extension or retraction? During this movement, determine the force and velocity. The piston and rod diameter are 75mm and 25mm respectively. The pump flow rate is 8 lpm and the system pressure is 7 Mpa.	10	CO3

SECTION-C

Q1 For the system shown in figure 1, the cylinder is free (both ends vented to the atmosphere) in the unactuated (spring offset) position of the direction control valve . Redesign the system using the same component to accomplish the following operations.

(a) The cylinder rod moves left when only V1 is actuated

(b) The cylinder rod moves right when only V2 is actuated

(c) The cylinder rod stops moving when a single actuated valve is unactuated

(d) When both valve are actuated , the cylinder is free (both ends vented to the atmosphere)

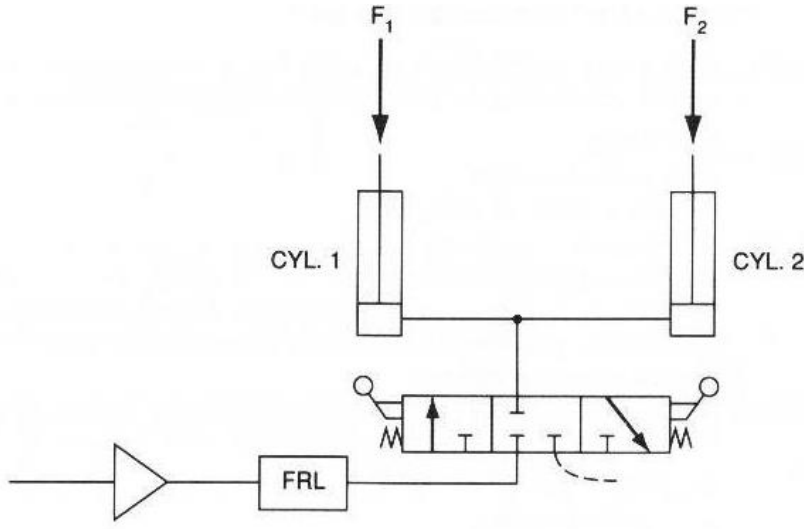


Figure1

20 CO4

OR

The pneumatic system shown in figure2 contains a double rod cylinder controlled by two three way, two position, and direction control valve. Describe the four operating condition for this system.

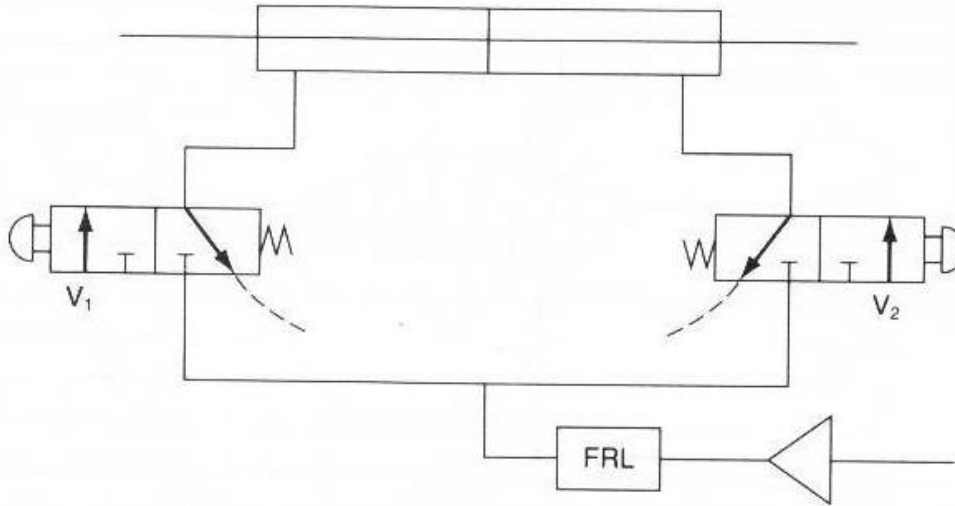


Figure 2