Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course:Hydraulics & Pneumatics **Semester: VI**
Program: B.Tech Mechatronics **Time : 03 hrs.**
Course Code: MECH2026 **Max. Marks: 100**

Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Sketch the graphical symbol of the following pneumatic component (a) Air filter (b) pneumatic booster (c) pneumatic silencer (d) 5/3 spring centered pilot operated pneumatic valve	**4**	**CO1**
Q 2	List the physical properties of hydraulic oil.	**4**	**CO1**
Q 3	Define hydrostatic transmission system. List the application of hydrostatic transmission.	**4**	**CO2**
Q 4	Relative to the air motors, define the term starting torque.	**4**	**CO2**
Q 5	Describe the function of pneumatic filter-regulator-lubricator(FRL)	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	A hydrostatic transmission operating at 105 bars pressure has the following characteristics: Pump — Motor $V_D = 150\ m^3$ — V_D=? $\eta_v = 80\%$ — $\eta_v = 90\%$ $\eta_m = 92\%$ — $\eta_m = 90\%$ N=1200rpm — N=650rpm Calculate the (a) Displacement of the motor (b)Motor output torque	**10**	**CO3**

Q 7	An electric motor drives a pump at constant speed and delivers power to the pump at a constant rate. The pump delivers oil to a hydraulic cylinder. By what factor would the cylinder force and time to travel through full stroke change during extension if (a) The cylinder stroke is doubled, and the piston and rod diameter remain the same (b) The piston and rod diameter are both doubled and the stroke remains the same (c) The stroke, piston and rod diameters are all doubled	**10**	**CO3**
Q 8	Sketch the constructional features of hydraulic counterbalance valve.	**10**	**CO3**
Q 9	For the double pump hydraulic circuit, find the pressure setting of the unloading valve and pressure relief valve under the following conditions: (a) Sheet metal punching operation requires a force of 2000 N (b) Hydraulic cylinder has a 50 mm diameter piston and 25mm diameter rod (c) During rapid extension of the cylinder, a frictional pressure losses of 5 bar occurs in the line from the high flow pump to the blank end of the cylinder. During the same time a 10 bar pressure loss occurs in the return line from the rod end of the cylinder to the oil tank. (d) Assume that the unloading valve and pressure relief valve pressure setting should be 50 % higher than the pressure required to overcome frictional pressure losses and the cylinder punching load. OR Sketch the constructional features of the solenoid operated 4/3 way spring centered direction control valve.	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q 10	The system shown in figure 1 contains a pump delivering high pressure oil to a hydraulic motor, which drive an external load via a rotating shaft. The following data are given: Pump: Hydraulic Motor $\eta_v = 92\%$ $\eta_v = 90\%$ $\eta_m = 94\%$ $\eta_m = 92\%$ $V_D = 150\ cm^3$ $V_D = 100\ cm^3$	**20**	**CO4**

$N = 1000rpm$ Inlet pressure p_2 required to drive load=150 bar

Inlet Pressure=-1.5 bar Motor discharge pressure=2 bar

Pump Discharge pipeline

Pipe: Pipe diameter 40 mm and 50 cm long

Fittings: two elbows(K=0.75 for each elbow) , one check valve (K=4.0_)

Oil:

Viscosity =125cS

Specific gravity =0.9

If the hydraulic motor is 20cm above the pump. Determine the

(a) pump flow rate (b) pump discharge pressure (c) Overall efficiency of the system.

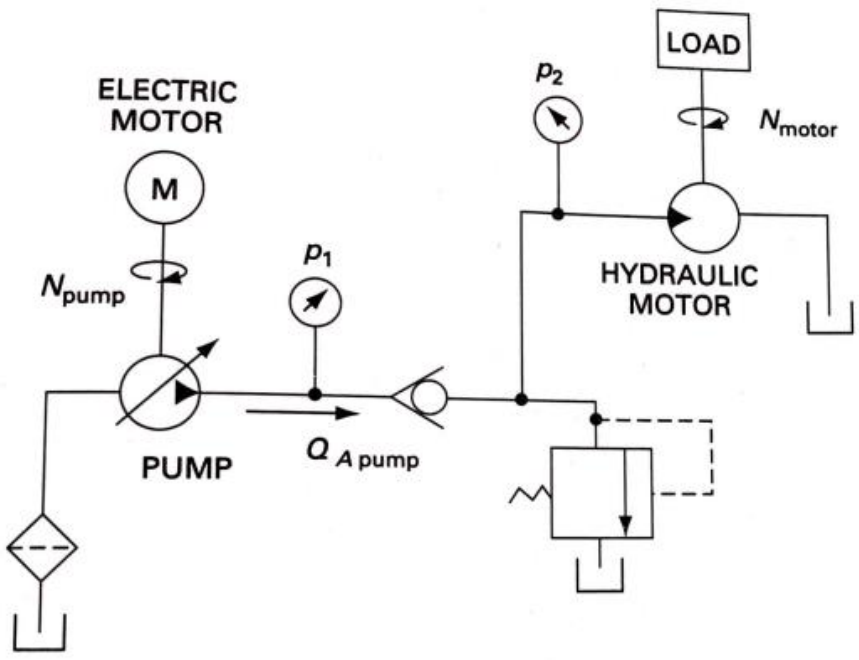

Figure1

Q 11	Design the pneumatic circuit for the deceleration air cushion of a pneumatic cylinder OR Discuss the pneumatic vacuum systems. Design the vacuum system for the material handling applications.	**20**	**CO4**