BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2024)

CLASS: B.TECH **SEMESTER : VI**
BRANCH: MECHANICAL **SESSION : SP/2024**

SUBJECT: ME373 HYDRAULIC AND PNEUMATC CONTROL

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Write advantages and disadvantages of the power hydraulic system.	[2]	1	2
Q.1(b)	Draw a suitable sketch of a Vane Pump, and describe its working principle.	[3]	1	2
Q.2(a)	Draw the standard ISO symbol of variable displacement hydraulic Pump/Motor and Direct operated pressure relief valve.	[2]	1	2
Q.2(b)	A bent axis pump has the following parameters: number of pistons (z) = 9; piston diameter (d) = 9.3 mm; pitch circle diameter (D) = 33 mm driving speed (n) = 4000 rpm; inlet pressure (P_i) = 0.3 MPa; exit pressure (P_e) = 18 MPa; volumetric efficiency (η_v) = 0.94; total efficiency (η_o) = 0.89; hydraulic efficiency (η_h) = 1; inclination angle of cylinder block (a) = 20°. Calculate the pump theoretical flow (Q_{th}), real flow (Q_{act}), input mechanical power (P) and driving torque (T).	[3]	1	4
Q.3(a)	Why control valves are necessary in power hydraulic system. Classify the control valves.	[2]	2	2
Q.3(b)	Draw schematically a pilot-operated relief valve, and explain its function.	[3]	2	2
Q.4(a)	A Direct-Operated Pressure relief valve having poppet diameter 20 mm. and it is connected to the high pressure line in the hydraulic system. During assembly a spring with a spring constant of 25000 N/m is installed to hold the poppet against its seat spring stiffness is operated in a hydraulic system. The adjustment mechanism is then set so that the spring is initially compressed 0.20 mm from its free-length condition. In order to pass full pump flow through the valve at the PRV pressure setting, the poppet must move 0.10 mm from its fully closed position. The Atmospheric pressure is 1 bar. Determine the a. Cracking pressure b. Full pump flow pressure (PRV pressure setting). c. Calculate the power loss into the system when PRV is fully opened and the fluid velocity is 10m/s.	[5]	2	4
Q.5(a)	Write short note on Double-acting hydraulic cylinder.	[2]	3	2
Q.5(b)	Write differences between Closed-loop and Open-loop hydraulic system.	[3]	3	2

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