USN | | | | | | | | | | BMT403

Fourth Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024
Hydraulics and Pneumatics

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain with a neat sketch structure of hydraulic control system.	10	L1	CO1
	b.	Calculate the volumetric displacement, theoretical flow rate, actual flow rate, theoretical torque and theoretical power of a gear pump operating at 70 bar. It has a outer diameter of 75 mm, internal diameter of 50 mm and width of 25 mm. The volumetric efficiency 90% at rated pressure and given pump speed is 1000 rpm.	10	L3	CO1
		OR			
Q.2	a.	Explain with schematic diagram the air filter used in a FRL unit of a pneumatic system.	10	L1	CO1
	b.	Determine the theoretical flowrate, overall efficiency, volumetric efficiency, mechanical efficiency and theorical torque of a hydraulic pump which has a displacement volume of 0.00012 m^3/rev. Its actual flow rate is 0.0015 m^3/sec at 900 rpm and 75 bar. The actual torque input by the prime mover to the pump is 150 N-m.	10	L3	CO1
		Module – 2			
Q.3	a.	Illustrate the working of unbalanced vane motor.	10	L2	CO2
	b.	Classify the following valves into direction valve, pressure control valve and flow control valve and explain with neat constructional diagram the working of Direct Acting Pressure Relief Valve. i) 4/3 way valve ii) unloading valve iii) Pressure compensated valve.	10	L2	CO2
		OR			
Q.4	a.	Illustrate the working of Swash plate type piston motor.	10	L2	CO2
	b.	Explain with a neat sketch the construction and working of a double pilot operated direction control valve.	10	L2	CO2
		Module – 3			
Q.5	a.	Develop a double acting cylinder hooked up in a regenerative circuit using a 3/2 DCV. The relief valve setting is 70 bar. The piston area is 0.016m^2 and rod area is 0.0045m^2. If the pump flow is 0.0013m^2/s, determine the speed and load (force) carrying capacity required for a successful extending stroke and refracting stroke.	10	L3	CO3

	b.	Classify filters and schematically illustrate the common location of it in hydraulic system.	10	L1	CO3
		OR			
Q.6	a.	Analyze the following cases and illustrate hydraulic circuits involving accumulator as a solution for respective cases. Case 1 : To supplement the pump flow during intermittent periods whenever the flow demand is higher. Case 2 : Fluid supply is not available due to power failure and the cylinder has to be retraited condition. Case 3 : Internal/External leakage, when system is pressurized but not in operation. Case 4 : Emergency closure of pressure line resulting in waste hammering.	10	L3	CO3
	b.	Illustrate the constructional features of standard hydraulic reservoir.	10	L1	CO3
Module – 4					
Q.7	a.	Illustrate structure of pneumatic control system.	10	L2	CO1
	b.	Develop a pneumatic circuit to control the speed of a double acting cylinder by suitable air throttling method. Justify the method.	10	L3	CO4
		OR			
Q.8	a.	Classify pneumatic linear actuator and illustrate various Single Acting Cylinders.	10	L2	CO4
	b.	Illustrate a Pneumatic circuit to Indirectly Control a Double Acting Cylinder using a memory valve.	10	L3	CO4
Module – 5					
Q.9	a.	Develop a pneumatic circuit for a double acting cylinder to extend if one or both of two push buttons are operated. If both push buttons are then released the cylinder into retract.	10	L3	CO5
	b.	Build an electro-pneumatic circuit diagram to control double acting cylinder using direct method along with its electrical circuit for solenoid valve.	10	L4	CO5
		OR			
Q.10	a.	Construct pneumatic circuit for a transport system where a pneumatic 'Cylinder A' has to push a trolley to its desired rail with pre condition that the 'Cylinder A' will start advancing after a time delay of 20 sec and retract to its original position after a time delay of 10 sec.	10	L3	CO5
	b.	Build an Electro-pneumatic circuit diagram to control double acting cylinder using indirect method along with its electrical circuit for solenoid valve using 5/2 single solenoid valve.	10	L4	CO5

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