Roll No.											

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 10- 12- 2025 **Time:** 1.00pm to 04.00pm

School: SOE	**Program:** B. Tech. MECHANICAL ENGINEERING	
Course Code: MEC3062	**Course Name:** Hydraulics and Pneumatics	
Semester: V	**Max Marks**: 100	**Weightage**:50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Marks	**12**	**12**	**24**	**24**	**24**	**24**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	State the fundamental law that governs the force and pressure relationship in a hydraulic system.	**2 Marks**	**L1**	**CO1**
2.	List two main types of Pressure Control Valves used in hydraulic circuits.	**2 Marks**	**L1**	**CO2**
3.	Give the formula for calculating the force produced by a hydraulic cylinder on its extending stroke.	**2 Marks**	**L1**	**CO3**
4.	State two significant advantages of using pneumatic systems over hydraulic systems, specifically related to the working fluid.	**2 Marks**	**L1**	**CO3**
5.	Define Mechanical Efficiency of a hydraulic motor.	**2 Marks**	**L1**	**CO4**
6.	What is meant by Signal Overlap in the context of multi-cylinder pneumatic sequencing?	**2 Marks**	**L1**	**CO4**
7.	List the primary function of the Reservoir (Tank) in a hydraulic power unit.	**2 Marks**	**L1**	**CO5**

8.	What is the main function of the Filter and the Lubricator in a pneumatic FRL unit?	**2 Marks**	**L1**	**CO5**
9.	Define the term Critical Torque in the context of hydraulic motors.	**2 Marks**	**L1**	**CO6**
10.	State one major limitation of hydraulic systems related to their operating environment.	**2 Marks**	**L1**	**CO6**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Describe the main components of a basic hydraulic power system, detailing the function of each component with the aid of a neat sketch.	**10 Marks**	**L2**	**CO1**
	b.	Differentiate between Pressure Control Valves and Flow Control Valves based on their primary function, their hydraulic symbol, and their effect on actuator movement.	**10 Marks**	**L2**	**CO2**
Or					
12.	**a.**	Describe the construction and operation of a Three-Position, Four-Way (4/3) Directional Control Valve with a tandem center and spring return mechanism.	**10 Marks**	**L2**	**CO1**
	b.	Explain the key advantages and limitations of hydraulic systems, justifying why they are preferred in high-power, compact applications.	**10 Marks**	**L2**	**CO2**

13.	A pump has a displacement volume of 98.4 cm^3. It delivers 0.0152 m^3/s of oil at 1000 RPM and a pressure of 70 bar, with the prime mover input torque being 124.3 Nm. What is the overall efficiency of the pump? Additionally, what is the theoretical torque required to operate the pump?	**20 Marks**	**L3**	**CO3**
Or				
14.	What is the theoretical flow rate from a fixed-displacement axial piston pump with a nine bore cylinder operating at 2000 RPM? Each bore has a diameter of 15 mm and stroke is 20 mm. How much hydraulic power would a pump produce when operating at 140 bar and delivering 0.001 m3/s of oil? What power rated electric motor would be selected to drive this pump if its overall efficiency is 85%?	**20 Marks**	**L3**	**CO6**

15.	A compressor delivers 400 m3 of free air per hour at a pressure of 6 bar gauge and a temperature of 40 degree celsius . Atmospheric air at compressor intake has a relative humidity of 80 % and a temperature of 20 . Determine the amount of water that can be extracted from the compressor plant per hour. Note: (a) At 20 and zero bar gauge pressure, 100 m3 of free saturated air contains 1.73 kg of water. (b) corresponding to 40 , and 6 bar compressor output pressure, amount of water per 100 m3 of free saturated air is given by 0.728	**20 Marks**	**L4**	**CO3**
	Or			
16.	a. Calculate the required size of the receiver that must supply air to pneumatic system consuming for 10 minutes between 828 kPa and 690 kPa before the compressor resumes operation. b. what size is required if the compressor is running and delivering at 0.170 m3/min	**20 Marks**	**L4**	**CO6**

17.	Evaluate the function of an Accumulator in a hydraulic system. List and briefly describe the three main Separator Types of gas-loaded accumulators, justifying their use over non-separator types.	**20 Marks**	**L5**	**CO5**
	Or			
18.	Evaluate the hydraulic circuit design of single and double acting cylinder with a neat sketch for any one application, mention the application name.	**20 Marks**	**L5**	**CO5**