# INSTITUTEOFAERONAUTICALENGINEERING

**(Autonomous)**
Dundigal, Hyderabad-500043

## MECHANICAL ENGINEERING

## TUTORIAL QUESTION BANK

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| **Course Title** | **DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS** | | | | |
| **Course Code** | AME519 | | | | |
| **Programme** | B.Tech | | | | |
| **Semester** | V | ME | | | |
| **Course Type** | Elective | | | | |
| **Regulation** | **IARE - R16** | | | | |
| **Course Structure** | **Theory** | | | **Practical** | |
| | **Lectures** | **Tutorials** | **Credits** | **Laboratory** | **Credits** |
| | 3 | 1 | 3 | - | - |
| **Chief Coordinator** | Dr. G Musalaiah, Assistant Professor | | | | |
| **Course Faculty** | Mr. G Musalaiah, Assistant Professor | | | | |

## COURSE OBJECTIVES:

| **The course should enable the students to:** | |
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| I | Understand of basic knowledge of hydraulic and pneumatic systems. |
| II | Classification of pumps based on the working phenomenon. |
| III | Use of hydraulic power pack in the hydraulic systems. |
| IV | Design of hydraulic circuits based on the application. |

## COURSE OUTCOMES (COs):

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| CO 1 | To expose the student to the different types of hydraulic and pneumatic systems and their operating principle. To learn the fundamentals and working of different pumps used in the hydraulic system. |
| CO 2 | Understanding the application of hydraulic power pack in the domain of a hydraulic system. |
| CO 3 | To enhance the different hydraulic circuits and function of accumulator used in the hydraulic system. Applying the knowledge of hydraulic and pneumatic systems in the field of automation in the industries and various applications. |
| CO 4 | To expose the student to the different types of hydraulic and pneumatic systems and their operating principle. |
| CO 5 | To learn the fundamentals and working of different pumps used in the hydraulic system. |

## COURSE LEARNING OUTCOMES (CLOs):

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| AME519.01 | Outline of various systems |
| AME519.02 | Understand the principles |
| AME519.03 | Understand the properties of hydraulic fluid |
| AME519.04 | Define pump and its types |
| AME519.05 | Understand the flow rate of pumps and efficiency |
| AME519.06 | Selection and specifications of different types of pumps. |
| AME519.07 | Discuss about actuators and effect of pressure |
| AME519.08 | Define elements of power pack systems |
| AME519.09 | Discuss about the capacity of hydraulic systems |
| AME519.10 | Understand the importance of safety systems. |
| AME519.11 | Define hydraulic circuits and valves. |
| AME519.12 | Explain about different hydraulic circuits. |
| AME519.13 | Discuss the various types of control valves. |
| AME519.14 | Understand the working of solenoid valve |
| AME519.15 | Understand the hydraulic and pneumatic equipment in detailed. |
| AME519.16 | Understand the programmable logic circuits and controllers. |
| AME519.17 | Discuss the maintenance and troubleshooting of hydraulic systems. |
| AME519.18 | Understand the hydraulic and pneumatic equipment in detailed. |

**TUTORIAL QUESTION BANK**

| UNIT- I | | | | |
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| **OIL AND HYDRAULICS SYSTEMS** | | | | |
| **Part - A (Short Answer Questions)** | | | | |
| **S No** | **QUESTIONS** | **Blooms Taxonomy Level** | **Course Outcomes** | **Course Learning Outcomes (CLOs)** |
| 1 | What is a fluid? What are hydraulic fluids? | Remember | CO 1 | AME519.01 |
| 2 | Explain the Pascal's law. | Remember | CO 1 | AME519.01 |
| 3 | Explain the Bernoulli's principle. | Remember | CO 1 | AME519.01 |
| 4 | Explain the Torricelli's principle. | Remember | CO 1 | AME519.01 |
| 5 | Explain fluid principle. | Remember | CO 1 | AME519.01 |
| 6 | State the various properties of oil. | Remember | CO 1 | AME519.01 |
| 7 | Explain viscosity. | Remember | CO 1 | AME519.02 |
| 8 | Explain the properties of hydraulic fluids. | Remember | CO 1 | AME519.02 |
| 9 | Name basic components in hydraulic systems. | Remember | CO 1 | AME519.02 |
| 10 | Name few applications of hydraulics. | Remember | CO 1 | AME519.02 |
| 11 | What is a fluid? What are the functions and characteristics of hydraulic fluids? | Understand | CO 1 | AME519.02 |
| 12 | Name the basic components required in hydraulic system. | Understand | CO 1 | AME519.03 |
| 13 | Name few applications of hydraulics. | Understand | CO 1 | AME519.03 |
| 14 | Name some common fault occur in pneumatic systems. | Understand | CO 1 | AME519.03 |
| 15 | Name any two faults observed in hydraulic systems. | Understand | CO 1 | AME519.03 |
| 16 | Why should a lubricator be used in pneumatic system? | Understand | CO 1 | AME519.03 |
| 17 | How does a hydro pneumatic system differ from hydraulic system? | Understand | CO 1 | AME519.03 |
| 18 | State the basic advantage of a hydraulic system over mechanical system. | Remember | CO 1 | AME519.03 |
| 19 | Define pressure. Does friction influence pressure in a hydraulic system. | Remember | CO 1 | AME519.03 |
| 20 | Explain the characteristics of hydraulic fluids. | Remember | CO 1 | AME519.03 |
| **Part - B (Long Answer Questions)** | | | | |
| 1 | What are the four primary functions of a hydraulic fluid ? How is the viscosity of hydraulic oil effected by the temperature change. | Remember | CO 1 | AME519.01 |
| 2 | Discuss the general criteria to be considered for selection of hydraulic fluid. | Remember | CO 1 | AME519.01 |
| 3 | Explain in detail different element of hydraulic system. | Remember | CO 1 | AME519.01 |
| 4 | An oil having a density of 0.89g/cm3 is tested using a kinematic viscosity.The given amount of oil flowed through the capillary tube in 250s. The calibration constant is 0.100. Find the kinematic and absolute viscosities in poise and centipoises. | Remember | CO 1 | AME519.01 |
| 5 | Describe the environmental issues dealing with developing biodegradable fluids, reduce oil leakage and reducing noise levels. | Remember | CO 1 | AME519.01 |
| 6 | Differentiate between hydraulics and pneumatics. | Remember | CO 1 | AME519.01 |
| 7 | Compare the use fluid power to a mechanical system by listing the advantages and disadvantages of each. | Remember | CO 1 | AME519.01 |
| 8 | Compare the use fluid power to a electrical system by listing the advantages and disadvantages of each. | Remember | CO 1 | AME519.02 |
| 9 | Compare the use fluid power to a hydraulic system by listing the advantages and disadvantages of each. | Understand | CO 1 | AME519.02 |
| 10 | Compare the use fluid power to a pneumatic system by listing the advantages and disadvantages of each. | Understand | CO 1 | AME519.02 |
| 11 | Discuss in detail about the maintenance of hydraulic oils. | Understand | CO 1 | AME519.02 |
| 12 | Compare the mechanical over electrical system in detail. | Understand | CO 1 | AME519.02 |
| 13 | Compare the Pneumatic over electrical system in detail. | Understand | CO 1 | AME519.02 |
| 14 | Discuss in detail about the maintenance oil hydraulic element. | Understand | CO 1 | AME519.02 |
| 15 | Compare the mechanical over pneumatic system in detail. | Understand | CO 1 | AME519.02 |
| 16 | Why is pre-filtration advocated for pumping oil from a fresh drum to a hydraulic system? | Understand | CO 1 | AME519.02 |
| 17 | Classification of hydraulic fluids in detail and their properties. | Remember | CO 1 | AME519.03 |
| 18 | Explain the analysis of automation in detail and dust and decay of oils. | Remember | CO 1 | AME519.03 |
| 19 | What are the key aspects regarding the selection of hydraulic pumps? | Remember | CO 1 | AME519.03 |

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| 20 | Discuss the properties of hydraulic fluid and their selection procedure. | Remember | CO 1 | AME519.03 |
| | **Part - C (Problem Solving and Critical Thinking Questions)** | | | |
| 1 | What criteria should be considered for selection of oils for a given hydraulic oil? | Understand | CO 1 | AME519.01 |
| 2 | What are the broad tasks of a hydraulic oil in a hydraulic machine? | Remember | CO 1 | AME519.01 |
| 3 | Establish the correlation with units between mechanical force system, electrical voltage system and hydraulic pressure system. | Remember | CO 1 | AME519.01 |
| 4 | Explain the types of hydraulic fluids, and selection criteria for a hydraulic system. | Remember | CO 1 | AME519.02 |
| 5 | Explain hydraulic system for force and motion, analysis in automation. | Remember | CO 1 | AME519.02 |
| 6 | Explain pneumatic system for force and motion analysis in automation. | Remember | CO 1 | AME519.02 |
| 7 | Explain electrical system for force and motion analysis in automation. | Understand | CO 1 | AME519.03 |
| 8 | Explain mechanical system for force and motion analysis in automation. | Understand | CO 1 | AME519.03 |
| 9 | How does one check water contamination of hydraulic oils? | Remember | CO 1 | AME519.03 |
| 10 | What precautions are to be taken to save oil from contamination? | Remember | CO 1 | AME519.03 |
| | **UNIT -II** | | | |
| | **HYDRAULIC PUMPS** | | | |
| | **Part – A (Short Answer Questions)** | | | |
| 1 | What is the function of a pump? | Remember | CO 2 | AME519.04 |
| 2 | Distinguish between single acting and double acting actuators. | Understand | CO 2 | AME519.04 |
| 3 | What is the difference between fixed displacement and variable displacement pump? | Remember | CO 2 | AME519.04 |
| 4 | Explain in detail about piston pump. | Remember | CO 2 | AME519.04 |
| 5 | What is a differential cylinder? | Remember | CO 2 | AME519.04 |
| 6 | State the advantages of a positive displacement over non positive displacement pump. | Remember | CO 2 | AME519.06 |
| 7 | What is meant by pump optimization? | Remember | CO 2 | AME519.06 |
| 8 | Explain difference between linear and rotary actuator. | Remember | CO 2 | AME519.06 |
| 9 | Write a short note on specifications of hydraulic pumps. | Understand | CO 2 | AME519.06 |
| 10 | What are the main aspects in selection of hydraulic pumps? | Understand | CO 2 | AME519.06 |
| 11 | What is meant by cushioning effect.? | Remember | CO 2 | AME519.07 |
| 12 | Write a short on oil seals. | Understand | CO 2 | AME519.07 |
| 13 | What is telescopic cylinder. when would it normally be used? | Understand | CO 2 | AME519.07 |
| 14 | What is a gear pump? | Understand | CO 2 | AME519.07 |
| 15 | Explain difference between linear and rotary actuators. | Understand | CO 2 | AME519.04 |
| 16 | Write a note on rotary actuators. | Remember | CO 2 | AME519.05 |
| 17 | Write a note on the classification of pumps. | Remember | CO 2 | AME519.06 |
| 18 | State the advantages of a positive displacement pumps over non positive displacement pump. | Remember | CO 2 | AME519.05 |
| 19 | What is meant by Q-H curve and explain? | Remember | CO 2 | AME519.06 |
| 20 | What is meant by positive displacement pump? | Remember | CO 2 | AME519.06 |
| | **Part - B (Long Answer Questions)** | | | |
| 1 | State the role of a pump in a hydraulic system. Classify pumps. What is a positive displacement pump? Why is it called positive displacement? | Understand | CO 2 | AME519.04 |
| 2 | Hoe does an external gear pump differ from an internal gear pump? What type of gears are generally used in gear pumps? State them. | Remember | CO 2 | AME519.04 |
| 3 | Explain the working of a vane pump. Derive an expression for theoretical discharge | Remember | CO 2 | AME519.04 |
| 4 | Classify the hydraulic pumps. Describe the working of rotary pumps Piston pumps. What are merits of it. | Understand | CO 2 | AME519.04 |
| 5 | State various types of linear actuators used in hydraulic system. What is a telescopic cylinder. State any three applications of such a cylinder. | Understand | CO 2 | AME519.04 |
| 6 | What is pump ripple? why does pump ripple occurs in a pump? What is the advantages of using an odd number of piston pump compared to even number of pistons? | Remember | CO 2 | AME519.04 |
| 7 | State various types of linear actuators used in hydraulic systems. What is a telescopic cylinder? State at least three applications of such a cylinder. | Understand | CO 2 | AME519.04 |
| 8 | Explain detail about selection, specification and characteristics of bent axis in line piston pump. | Remember | CO 2 | AME519.05 |

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| 9 | Explain detail about selection, specification and characteristics of Rotary Actuators. | Remember | CO 2 | AME519.05 |
| 10 | Explain detail about selection, specification and characteristics of gear pump. | Remember | CO 2 | AME519.05 |
| 11 | In certain hydraulic systems, pressurized reservoirs are used. Why? Where is such a reservoir used. | Remember | CO 2 | AME519.05 |
| 12 | What is an accumulator? How does it differ from a reservoir? | Remember | CO 2 | AME519.06 |
| 13 | Classify hydraulic pumps. Describe the working of rotary piston pumps? What are the advantages of it. | Remember | CO 2 | AME519.06 |
| 14 | Which are the most important factors one should consider while selecting a hydraulic pump for a specific application? state them? | Remember | CO 2 | AME519.06 |
| 15 | What is PTFE? What is its common commercial name? state its characteristics? | Remember | CO 2 | AME519.06 |
| 16 | Explain the construction and function of screw pump. | Understand | CO 2 | AME519.09 |
| 17 | Sate various types of commonly used accumulator. | Understand | CO 2 | AME519.06 |
| 18 | Explain the construction and function of bent axis in line piston pump. | Remember | CO 2 | AME519.06 |
| 19 | Which pumps are noiser-external gear internal gear or piston pumps? Which pump generates the least noise? | Remember | CO 2 | AME519.06 |
| 20 | Why cushioning needed in a hydraulic cylinder. Explain with a neat sketch, the principle of operation of a fixed cushioned cylinder? | Remember | CO 2 | AME519.05 |
| | **Part - C (Problem Solving and Critical Thinking Questions)** | | | |
| 1 | A cylinder has a bore of 125mm diameter and a rod of 70mm diameter. It drives a load of 2000kg vertically up and down at a maximum velocity of 3m/s. The load is slowed down to rest in the cushioning length of 50mm. If the relief valve is set at 140 bar, determine the average pressure in the cushions while extending and retracting. | Remember | CO 2 | AME519.04 |
| 2 | Explain any two types piston types pumps prime mover mechanisms with neat sketches. | Remember | CO 2 | AME519.04 |
| 3 | Explain importance of piston rod and effect on pressure. | Understand | CO 2 | AME519.04 |
| 4 | Differentiate internal and internal gear pump. | Remember | CO 2 | AME519.09 |
| 5 | Describe screw pump and vane pump with neat sketches. | Understand | CO 2 | AME519.05 |
| 6 | Explain the hydraulic balanced circuit with neat sketch. | Remember | CO 2 | AME519.05 |
| 7 | Explain the linear actuators with neat sketch . | Remember | CO 2 | |
| 8 | Explain the rotary actuators with neat sketch. | Understand | CO 2 | AME519.05 |
| 9 | Explain the synchronizing circuits and sequencing circuit with neat sketch. | Understand | CO 2 | AME519.06 |
| 10 | what is the sequencing circuit with neat sketch? | Understand | CO 2 | AME519.06 |
| | **UNIT –III** | | | |
| | **HYDRAULIC POWER PACK** | | | |
| | **Part - A (Short Answer Questions)** | | | |
| 1 | Explain power pack in detail. | Understand | CO 3 | AME519.07 |
| 2 | Explain pressure relief valve. | Understand | CO 3 | AME519.07 |
| 3 | Explain heating and cooling systems for hydraulic power pack. | Understand | CO 3 | AME519.07 |
| 4 | Explain the importance of line pressure in power pack. | Understand | CO 3 | AME519.07 |
| 5 | Describe the selection of size and capacity of power pack. | Understand | CO 3 | AME519.07 |
| 6 | What do you understand by the term power pack? | Remember | CO 3 | AME519.07 |
| 7 | List the drawbacks of simple pressure relief valve. | Remember | CO 3 | AME519.07 |
| 8 | Why is a pressure relief valve used in a hydraulic system? State the basic types of pressure relief valve? | Remember | CO 3 | AME519.08 |
| 9 | Why is pressure reducing valve used in a hydraulic system? | Remember | CO 3 | AME519.08 |
| 10 | What is a safety valve? Name one application? | Remember | CO 3 | AME519.08 |
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| 11 | Explain the safety system. | Remember | CO 3 | AME519.08 |
| 12 | What is the line pressure? | Understand | CO 3 | AME519.09 |
| 13 | Explain the importance of pressure relief valve in hydraulic power pack. | Understand | CO 3 | AME519.09 |
| 14 | What is the use of safety system in hydraulic power pack? | Understand | CO 3 | AME519.09 |
| 15 | Explain the cooling system for hydraulic power pack. | Understand | CO 3 | AME519.09 |
| 16 | Explain the heating system for hydraulic power pack. | Remember | CO 3 | AME519.08 |
| 17 | What are two types of relief valves? | Remember | CO 3 | AME519.10 |
| 18 | List the advantages and disadvantages of fluid power system. | Understand | CO 3 | AME519.10 |
| 19 | Give the graphical symbol for pressure reducing valve. | Understand | CO 3 | AME519.10 |
| 20 | Name any four pressure control valves used in hydraulics systems. | Understand | CO 3 | AME519.10 |

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| **Part – B (Long Answer Questions)** | | | | |
| 1 | Why is a pressure relief valve used in hydraulic system? State the basic types of pressure relief valves? | Understand | CO 3 | AME519.07 |
| 2 | Describe pressure relief valve with a neat sketch, and design a hydraulic circuit with a pressure relief valve. | Understand | CO 3 | AME519.07 |
| 3 | Describe the construction of pressure relief valve in hydraulic system with a neat sketch. | Understand | CO 3 | AME519.07 |
| 4 | Describe the safety systems in hydraulic circuits. | Understand | CO 3 | AME519.07 |
| 5 | How does a pressure relief valve differ from a pressure reducing valve? How does a pressure reducing valve work? | Understand | CO 3 | AME519.07 |
| 6 | Explain the heating and cooling system for hydraulic power pack. | Remember | CO 3 | AME519.07 |
| 7 | Explain the elements of power pack and their applications. | Remember | CO 3 | AME519.07 |
| 8 | Why is pressure relief valve used in hydraulic system? State the basic types of pressure relief valves? | Remember | CO 3 | AME519.07 |
| 9 | What is pressure compensated flow control valve? How does pressure compensation take place? | Remember | CO 3 | AME519.08 |
| 10 | Draw the neat sketch of a compound relief valve and discuss its operation. What is its use. | Remember | CO 3 | AME519.08 |
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| 11 | Explain the function and working principle of pressure reducing valves and sequence valves. | Remember | CO 3 | AME519.08 |
| 12 | Draw the neat sketch of a any two safety valves and discuss its operations. | Remember | CO 3 | AME519.08 |
| 13 | Discuss the types of pressure relief valves and their applications. | Remember | CO 3 | AME519.09 |
| 14 | Explain the importance of safety system in hydraulic power pack system. | Understand | CO 3 | AME519.09 |
| 15 | What is the working process of cooling system in hydraulic power pack? | Understand | CO 3 | AME519.09 |
| 16 | What is the working process of heating system in hydraulic power pack? | Understand | CO 3 | AME519.09 |
| 17 | Explain the factors which affect the selection of motors and discuss in detail the classification and performance features of different types of hydraulic fluids. | Understand | CO 3 | AME519.10 |
| 18 | What is the basic consideration in the design of a hydraulic power pack? | Remember | CO 3 | AME519.10 |
| 19 | With neat sketch describe the construction and operation of pressure regulated low control valve? | Remember | CO 3 | AME519.10 |
| 20 | Discuss with neat diagram the working of non-return valve. | Remember | CO 3 | AME519.10 |
| **Part – C (Problem Solving and Critical Thinking)** | | | | |
| 1 | Design and sketch the hydraulic power pack of 45 liter capacity with a gear pump and induction motor and other required elements. | Understand | CO 3 | AME519.07 |
| 2 | Design a hydraulic gear pump with 2.5 module and establish the discharge rate and pressure range. | Understand | CO 3 | AME519.10 |
| 3 | Discuss the details of the following factors in selection of hydraulic pump. | Understand | CO 3 | AME519.07 |
| 4 | How the hydraulic motors are rated and derive on equation for torque of the motor? | Understand | CO 3 | AME519.10 |
| 5 | Design and sketch pressure relief valve for 10 to 20 bar pressure valve. | Understand | CO 3 | AME519.08 |
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| 06 | How to design of hydraulic power pack system? | Remember | CO 3 | AME519.08 |
| 07 | Discuss the elements of hydraulic power pack system. | Remember | CO 3 | AME519.09 |
| 08 | What is the use of hydraulic motors in power pack system? | Remember | CO 3 | AME519.09 |
| 09 | How many types of connections in hydraulic motors? | Understand | CO 3 | AME519.09 |
| 10 | Explain the importance of power pack capacity in hydraulic system . | Understand | CO 3 | AME519.10 |
| **UNIT –IV** | | | | |
| **HYDRAULIC CIRCUIT AND ACCUMULATOR** | | | | |
| **Part – A (Short Answer Questions)** | | | | |
| 1 | Summarize the applications of synchronizing circuits | Remember | CO 4 | AME519.11 |
| 2 | How are accumulators used in hydraulic circuits? | Remember | CO 4 | AME519.11 |
| 3 | Draw the symbols of flow control valves, pressure control valves. . | Remember | CO 4 | AME519.11 |
| 4 | Explain regenerative circuit. | Understand | CO 4 | AME519.11 |
| 5 | Explain the usage of check valves in hydraulic circuit. | Understand | CO 4 | AME519.11 |
| 6 | Describe the criteria of selection of hydraulic pump. | Understand | CO 4 | AME519.12 |
| 7 | Classify the accumulator in hydraulic system. | Understand | CO 4 | AME519.12 |

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| 8 | Give the applications of synchronizing circuits. | Understand | CO 4 | AME519.12 |
| 9 | How are the accumulators used in Hydraulics circuits? | Remember | CO 4 | AME519.12 |
| 10 | What is a pilot operated check valve? | Remember | CO 4 | AME519.12 |
| 11 | What is the function of accumulator? | Remember | CO 4 | AME519.12 |
| 12 | List three important considerations to be taken into account while designing a hydraulic circuit. | Remember | CO 4 | AME519.23 |
| 13 | List various types of accumulators. | Remember | CO 4 | AME519.13 |
| 14 | Give the applications of synchronizing circuits. | Remember | CO 4 | AME519.13 |
| 15 | Draw symbols of the following check valve and flow control valves. | Remember | CO 4 | AME519.13 |
| 16 | Name any four pressure control valves used in hydraulics systems. | Understand | CO 4 | AME519.13 |
| 17 | How do a simple pressure relief valve in operation? | Understand | CO 4 | AME519.14 |
| 18 | What is the purpose of the check valve in sequence circuit? | Understand | CO 4 | AME519.14 |
| 19 | What is the purpose of a flow control valve? | Remember | CO 4 | AME519.24 |
| 20 | Describe a proportional solenoid operated flow control valve. | Remember | CO 4 | AME519.14 |
| **Part – B (Long Answer Questions)** | | | | |
| 1 | Describe the meter-in and meter-out in hydraulic system with a neat sketch. | Understand | CO 4 | AME519.11 |
| 2 | Describe the sequencing and synchronizing circuit in hydraulic system with a neat sketch. | Understand | CO 4 | AME519.11 |
| 3 | State various types of hydraulic valves. What is direction control valve? Why is it needed in a hydraulic system. | Understand | CO 4 | AME519.11 |
| 4 | Differentiate between flow control valve and pressure control valve. | Understand | CO 4 | AME519.11 |
| 5 | Differentiate with sketches the function and characteristics of closed centre and open center DC valves. | Understand | CO 4 | AME519.11 |
| 6 | Differentiate between a seat type and a spool type DC valve. Which of these two types are mostly used in hydraulic system? Why? | Remember | CO 4 | AME519.12 |
| 7 | What is overlap in valves? What is the influence of overlap in the function of a DC valve? | Remember | CO 4 | AME519.12 |
| 8 | Develop an accumulator circuit for leakage compensation and explain its working. | Remember | CO 4 | AME519.12 |
| 9 | What is an accumulator? State the application of accumulators. Explain the use of accumulator as leakage compensator with a hydraulic circuit? | Understand | CO 4 | AME519.12 |
| 10 | Draw a neat sketch and explain the function of following Synchronizing with flow control valves. | Understand | CO 4 | AME519.12 |
| 11 | List and explain all the steps required for designing a hydraulic power unit. | Understand | CO 4 | AME519.12 |
| 12 | Develop an accumulator circuit for leakage compensation and explain its working. | Understand | CO 4 | AME519.12 |
| 13 | Explain the construction and function of hydraulic circuit. | Understand | CO 4 | AME519.13 |
| 14 | Explain the construction and function of pneumatic circuit. | Understand | CO 4 | AME519.13 |
| 15 | What is a check valve? Show various uses of a check valve in the hydraulic circuit? | Remember | CO 4 | AME519.13 |
| 16 | What is an accumulator? State the application of accumulators? | Remember | CO 4 | AME519.23 |
| 17 | Draw a neat sketch and explain the function of Synchronizing with flow control valves. | Remember | CO 4 | AME519.24 |
| 18 | Draw a neat sketch and explain the function of Synchronizing with pressure control valves. | Understand | CO 4 | AME519.24 |
| 19 | Explain the manual and automatic hydraulic system with neat sketch. | Understand | CO 4 | AME519.14 |
| 20 | What is the use of check valves in hydraulic circuit? | Understand | CO 4 | AME519.24 |
| **Part – C (Problem Solving and Critical Thinking)** | | | | |
| 1 | Sketch and explain numerical the differences in Meter-in, meter-out hydraulic circuit in designing the force and motion analysis of a hydraulic cylinder. | Remember | CO 4 | AME519.11 |
| 2 | Design a bleed-off circuit in pneumatic systems, write down the applications of bleed-off circuit. | Remember | CO 4 | AME519.11 |
| 3 | Design a hydraulic circuit with check valves. Explain the use of check valves. Merits, demerits and applications. | Remember | CO 4 | AME519.11 |
| 4 | Design a hydraulic circuit with directional control valve, solenoid valve with a neat sketches . | Remember | CO 4 | AME519.12 |
| 5 | Design a hydraulic circuit with flow and pressure control valves with a neat sketch. | Remember | CO 4 | AME519.12 |
| 6 | What is an accumulator. State the application of accumulator. Explain the use of | Remember | CO 4 | AME519.12 |

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| | accumulator as leakage compensator with a hydraulic circuit? | | | |
| 7 | Explain meter in circuit and meter out circuit. Also mention their application. | Understand | CO 4 | AME519.13 |
| 8 | Explain low cost automation. Also mention their application. | Understand | CO 4 | AME519.13 |
| 9 | What is a proportional solenoid? How does it differ from an ordinary solenoid? | Understand | CO 4 | AME519.14 |
| 10 | Difference between the sequencing and synchronizing circuits. | Understand | CO 4 | AME519.14 |
| | **UNIT -V** | | | |
| | **AUTOMATION** | | | |
| | **Part - A (Short Answer Questions)** | | | |
| 1 | Write short notes on low cost automation. | Understand | CO 5 | AME519.15 |
| 2 | Summarize about PLC. | Understand | CO 5 | AME519.15 |
| 3 | Write short notes on micro controller. | Understand | CO 5 | AME519.15 |
| 4 | State the common faults in a hydraulic system. | Understand | CO 5 | AME519.15 |
| 5 | How maintenance and troubleshooting of pneumatic circuit is performed? | Understand | CO 5 | AME519.15 |
| 6 | State the various techniques used to inspect hydraulic oils. | Understand | CO 5 | AME519.15 |
| 7 | How maintenance and troubleshooting of hydraulic circuit is performed? | Remember | CO 5 | AME519.16 |
| 8 | Summarize the advantages of low cost automation. | Remember | CO 5 | AME519.16 |
| 9 | Define microcontroller and its applications. | Remember | CO 5 | AME519.16 |
| 10 | Differentiate between PLC and microcontroller. | Remember | CO 5 | AME519.16 |
| 11 | Distinguish between hydraulic and pneumatic systems. | Remember | CO 5 | AME519.16 |
| 12 | How do pneumatic actuators differ from hydraulic actuators? | Understand | CO 5 | AME519.17 |
| 13 | How is programmable logic circuit classified? | Understand | CO 5 | AME519.17 |
| 14 | State some of the important parameters which may require constant attention in a pneumatic system. | Understand | CO 5 | AME519.17 |
| 15 | Give six reasons for overheating of fluid in a hydraulic system. | Remember | CO 5 | AME519.17 |
| 16 | What is meant preventive maintenance? | Remember | CO 5 | AME519.18 |
| 17 | List the probable causes for the problem of leakage of compressed air in pneumatic systems. | Understand | CO 5 | AME519.18 |
| 18 | What is the hydraulic equipment in automation? | Understand | CO 5 | AME519.18 |
| 19 | What is the pneumatic equipment in automation? | Understand | CO 5 | AME519.18 |
| 20 | State the common faults in a hydraulic system. | Understand | CO 5 | AME519.18 |
| | **Part - B (Long Answer Questions)** | | | |
| 1 | Explain the hydraulic equipment in automation system. | Remember | CO 5 | AME519.15 |
| 2 | Differentiate between direct and indirect control. Draw simple hydraulic circuit diagrams of both and explain the differences. | Remember | CO 5 | AME519.15 |
| 3 | What is a functional diagram? How does it differ from a circuit diagram ? what are the advantages of such a diagram while trouble-shooting? | Remember | CO 5 | AME519.15 |
| 4 | What is oxidation? What is the effect of oxidation on hydraulic oil and the system? | Remember | CO 5 | AME519.15 |
| 5 | Explain troubleshooting of pneumatic circuit. | Remember | CO 5 | AME519.15 |
| 6 | Explain PLC in automation with a neat sketch, merits and demerits and applications. | Remember | CO 5 | AME519.15 |
| 7 | Summarize the steps involved in maintenance of hydraulic equipment. | Remember | CO 5 | AME519.16 |
| 8 | How does heat affect the hydraulic system? State some common sources of heat in a hydraulic system? | Understand | CO 5 | AME519.16 |
| 9 | What is condition monitoring? How does it influence the preventive maintenance of a hydraulic system? | Understand | CO 5 | AME519.16 |
| 10 | What is the purpose of providing lubricator in a pneumatic circuit? | Understand | CO 5 | AME519.16 |
| 11 | What is the function of reservoir in a pneumatic system? | Understand | CO 5 | AME519.16 |
| 12 | Design hydro pneumatic circuit for an industrial application and explain the working principle with application. | Understand | CO 5 | AME519.16 |
| 13 | Design a pneumatic circuit for a programmable logic circuit for an industrial application, state the limitations. | Understand | CO 5 | AME519.17 |
| 14 | Enlist important problems and remedial measures in a pneumatic system. | Remember | CO 5 | AME519.17 |
| 15 | With suitable sketches explain the working of any two hydro pneumatic circuits. | Understand | CO 5 | AME519.17 |
| 16 | Discuss the trouble, possible causes and remedies of hydraulic circuits. | Understand | CO 5 | AME519.17 |
| 17 | Discuss the trouble, possible causes and remedies of pneumatic circuits. | Understand | CO 5 | AME519.18 |
| 18 | Briefly explain the function and working principles of air-oil intensifier hydro pneumatic system. | Understand | CO 5 | AME519.18 |
| 19 | Explain hydraulic equipment in automation with a circuit diagram. | Remember | CO 5 | AME519.18 |

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| 20 | Explain hydraulic and pneumatic equipment in automation. | Remember | CO 5 | AME519.18 |
| **Part – C (Problem Solving and Critical Thinking)** | | | | |
| 1 | Explain LSA with a case study, merits demerits and applications. | Remember | CO 5 | AME519.15 |
| 2 | Explain PLC and logical gates in PLC with examples. | Remember | CO 5 | AME519.15 |
| 3 | Differentiate between LCA and microcontroller. | Remember | CO 5 | AME519.15 |
| 4 | Explain use of microcontroller for sequencing, Explain how microcontroller is used in automation, with a neat sketch, applications. | Remember | CO 5 | AME519.16 |
| 5 | Explain functioning of relay circuit. How it is used in automation. | Remember | CO 5 | AME519.16 |
| 6 | Describe the maintenance schedules and troubleshooting procedures for pneumatic circuits. | Remember | CO 5 | AME519.17 |
| 7 | Discuss the trouble, possible causes and remedies of hydraulic circuits. | Understand | CO 5 | AME519.17 |
| 8 | Write the oxidation? What is the effect of oxidation on hydraulic oil and the system? | Understand | CO 5 | AME519.17 |
| 9 | State the common faults in a hydraulic system? | Understand | CO 5 | AME519.18 |
| 10 | What factors influence cylinder friction? | Understand | CO 5 | AME519.18 |

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