

Hall Ticket No.

Question Paper Code: AME519



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

B.Tech V Semester End Examinations, November - 2019

Regulations: R16

DESIGN OF HYDRAULICS AND PNEUMATIC SYSTEMS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. a) Explain the types of hydraulic fluids, and selection criteria for a hydraulic system. [7M]
b) List all the properties that a good hydraulic fluid possesses. [7M]
2. a) Compare the use fluid power to a mechanical system by listing the advantages and disadvantages of each. [7M]
b) An oil having a density of 0.89g/cm^3 is tested using a kinematic viscometer. 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. [7M]

UNIT – II

3. a) Classify hydraulic pumps. Describe the working of rotary pumps. What are merits of rotary pumps? [7M]
b) Why is cushioning needed in a hydraulic cylinder? Explain with a neat sketch the principle operation of a fixed cushioned cylinder. [7M]
4. a) What is the difference between a variable displacement pump and fixed displacement pump. When do user prefer a variable displacement and fixed displacement pump. [7M]
b) Explain the working of a vane pump. Derive an expression for theoretical discharge. [7M]

UNIT – III

5. a) Design and sketch the hydraulic power pack of 15 liter capacity with a gear pump and induction motor and other required elements. [7M]
b) Discuss the details of the following factors in selection of hydraulic pump. [7M]
6. a) Describe pressure relief valve with a neat sketch and design a hydraulic circuit with a pressure relief valve. [7M]

- b) Design a hydraulic gear pump with 2.5 module and establish the discharge rate and pressure range. [7M]

MODULE – IV

7. a) Describe the meter-in and meter-out in hydraulic system with a neat sketch. [7M]
b) Explain accumulator. State the applications of accumulator. Explain the use of accumulator as leakage compensator with a hydraulic circuit. [7M]
8. a) Design a hydraulic circuit with directional control valve, solenoid valve with neat sketches. [7M]
b) Design a hydraulic circuit with check valves. Explain the use of check valves. Merits, demerits and applications. [7M]

MODULE – V

9. a) Explain with a block diagram the functions of PLC. [7M]
b) Explain PLC based circuit for extension and retraction of a cylinder and explains with a neat sketch. [7M]
10. a) Explain LSA with a case study, merits demerits and applications. [7M]
b) Describe the maintenance schedules and troubleshooting procedures for pneumatic circuits. [7M]



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COURSE OBJECTIVES:

The course should enable the students to:

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):

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):

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.

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No	Course Learning Outcomes		Course Outcomes	Bloom's Taxonomy Level	
1	a	AME519.01	Explain the types of hydraulic fluids, and selection criteria for a hydraulic system.	CO 1	Understand
	b	AME519.02	List all the properties that a good hydraulic fluid possesses.	CO 1	Understand
2	a	AME519.02	Compare the use fluid power to a mechanical system by listing the advantages and disadvantages of each.	CO 1	Understand
	b	AME519.03	An oil having a density of 0.89g/cm ³ is tested using a kinematic viscometer. 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.	CO 1	Understand
3	a	AME519.04	Classify hydraulic pumps. Describe the working of rotary pumps. What are merits of rotary pumps?	CO 2	Remember
	b	AME519.05	Why is cushioning needed in a hydraulic cylinder? Explain with a neat sketch the principle operation of a fixed cushioned cylinder.	CO 2	Understand
4	a	AME519.04	What is the difference between a variable displacement pump and fixed displacement pump. When do user prefer a variable displacement and fixed displacement pump.	CO 2	Remember
	b	AME519.06	Explain the working of a vane pump. Derive an expression for theoretical discharge.	CO 2	Understand
5	a	AME519.07	Design and sketch the hydraulic power pack of 15 liter capacity with a gear pump and induction motor and other required elements.	CO 3	Remember
	b	AME519.08	Discuss the details of the following factors in selection of hydraulic pump.	CO 3	Remember
6	a	AME519.09	Describe pressure relief valve with a neat sketch and design a hydraulic circuit with a pressure relief valve.	CO 3	Understand
	b	AME519.10	Design a hydraulic gear pump with 2.5 module and establish the discharge rate and pressure range.	CO 3	Understand
7	a	AME519.11	Describe the meter-in and meter-out in hydraulic system with a neat sketch.	CO 4	Remember
	b	AME519.12	Explain accumulator. State the applications of accumulator. Explain the use of accumulator as leakage compensator with a hydraulic circuit.	CO 4	Understand
8	a	AME519.13	Design a hydraulic circuit with directional control valve, solenoid valve with neat sketches.	CO 4	Understand
	b	AME519.14	Design a hydraulic circuit with check valves. Explain the use of check valves. Merits, demerits and applications.	CO 4	Remember
9	a	AME519.15	Explain with a block diagram the functions of PLC.	CO 5	Understand
	b	AME519.17	Explain PLC based circuit for extension and retraction of a cylinder and explains with a neat sketch.	CO 5	Remember
10	a	AME519.16	Explain LSA with a case study, merits demerits and applications.	CO 5	Understand
	b	AME519.18	Describe the maintenance schedules and troubleshooting procedures for pneumatic circuits.	CO 5	Understand

Signature of Course Coordinator

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