



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING

TUTORIAL QUESTION BANK

Course Name	DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS
Course Code	BCC004
Class	M. Tech II Semester CAD/CAM
Branch	Mechanical
Year	2017 - 2018
Course Coordinator	Mr. M. Vijay Kumar, Asst. Professor

OBJECTIVES:

This course introduces the basic components and functions of hydraulic and pneumatic systems. Design of power pack, design of hydraulic and pneumatic circuit. Design of circuit that can be used in automation.

S No	QUESTION BANK	Blooms taxonomy level	Course Outcomes
UNIT – I			
OIL AND HYDRAULICS SYSTEMS			
Part - A (Short Answer Questions)			
1	What is a fluid? What are hydraulic fluids?	Remember	1
2	Explain the Pascal's law.	Remember	1
3	Explain the Bernoulli's principle.	Remember	1
4	Explain the Torricelli's principle.	Remember	1
5	Explain fluid principle.	Remember	1
6	Briefly explain fluid properties.	Remember	1
7	Explain viscosity.	Remember	1
8	Explain the properties of hydraulic fluids	Remember	1
9	Name basic components in hydraulic systems.	Remember	1
10	Name few applications of hydraulics.	Remember	1
Part - B (Long Answer Questions)			
1	List all the properties that a good hydraulic fluid should possess.	Remember	1
2	Discuss the general criteria to be considered for selection of hydraulic fluid.	Remember	1
3	Explain in detail different element of hydraulic system.	Remember	1
4	An oil having a density of 0.89g/cm^3 is tested using a kinematic viscosimeter. 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	1
5	Describe the environmental issues dealing with developing biodegradable fluids, reduce oil leakage and reducing noise levels.	Remember	1
6	Differentiate between hydraulics and pneumatics.	Remember	1
7	Compare the use fluid power to a mechanical system by listing the advantages and disadvantages of each.	Remember	1
Part - C (Problem Solving and Critical Thinking Questions)			
1.	Comment on the difference between using pneumatic fluid	Understand	1

	power and hydraulic fluid power.		
2.	Explain oil hydraulic element and their representation with a neat sketch.	Remember	1
3.	Establish the correlation with units between mechanical force system, electrical voltage system and hydraulic pressure system.	Remember	1
4.	Explain the types of hydraulic fluids, and selection criteria for a hydraulic system.	Remember	1
5.	Explain hydraulic system for force and motion, analysis in automation.	Remember	1
6.	Explain pneumatic system for force and motion analysis in automation.	Remember	1

**UNIT-II
HYDRAULIC PUMPS**

Part – A (Short Answer Questions)

1	What is the function of a pump.	Remember	1
2	Distinguish between single acting and double acting actuators.	Understand	2
3	What is the difference between fixed displacement and variable displacement pump.	Remember	1
4	Expalin in detail about piston pump.	Remember	1
5	What is a differential cylinder.	Remember	1
6	State the advantages of a positive displacement over non positive displacement pump.	Remember	1
7	What is meant by pump optimization	Remember	1
8	Explain difference between linear and rotary actuator	Remember	1
9	Write a short note on specifications of hydraulic pumps.	Understand	2
10	What are the main aspects in selection of hydraulic pumps.	Understand	2
11	What is meant by cushioning effect.	Remember	2
12	Write a short on oil seals.	Remember	2
13	What is telescopic cylinder. when would it normally be used.	Remember	2

Part - B (Long Answer Questions)

1	What is the different between a variable displacement pump and fixed displacement pump. When do user prefer a variable displacement and fixed displacement pump.	Understand	2
2	Why cushioning needed in a hydraulic cylinder. Explain with a neat sketch, the principle of operation of a fixed cushioned cylinder.	Understand	2
3	Explain the working of a vane pump. Derive an expression for theoretical discharge	Understand	2
4	Classify the hydraulic pumps. Describe the working of rotary pumps Piston pumps. What are merits of it.	Understand	2
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	2
6	Explain detail about selection, specifications and characteristics of linear rotary actuator.	Remember	1
7	Explain the construction and function of internal gear motor	Understand	2

Part – C (Problem Solving and Critical Thinking)

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	2
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2	Explain any two types piston types pumps prime mover mechanisms with neat sketches.	Remember	2
3	Explain importance of piston rod and effect on pressure.	Understand	2
4	Differentiate internal and internal gear pump.	Remember	2
5	Describe screw pump and vane pump with neat sketches.	Understand	2
Part - A (Short Answer Questions)			
1	Explain power pack in detail.	Understand	3
2	Explain pressure relief valve.	Understand	3
3	Explain heating and cooling systems for hydraulic power pack.	Understand	3
4	Explain the importance of line pressure in power pack.	Understand	3
5.	Describe the selection of size and capacity of power pack.	Understand	3
Part – B (Long Answer Questions)			
1	Describe the power pack with a neat sketch.	Understand	3
2	Describe pressure relief valve with a neat sketch, and design a hydraulic circuit with a pressure relief valve.	Understand	3
3	Describe the construction of pressure relief valve in hydraulic system with a neat sketch.	Understand	3
4	Describe the safety systems in hydraulic circuits.	Understand	3
5	Design and sketch hydraulic power pack of 20 liter capacity with a gear pump and induction motor and other required elements.	Understand	3
Part - C (Problem Solving and Critical Thinking Questions)			
1	Design and sketch the hydraulic power pack of 15 liter capacity with a gear pump and induction motor and other required elements.	Understand	3
2	Design a hydraulic gear pump with 2.5 module and establish the discharge rate and pressure range.	Understand	3
3	Discuss the details of the following factors in selection of hydraulic pump.	Understand	3
4	How the hydraulic motors are rated and derive on equation for torque of the motor.	Understand	3
5.	Design and sketch pressure relief valve for 10 to 20 bar pressure valve.	Understand	3
UNIT-IV			
HYDRAULIC CIRCUIT AND ACCUMULATOR			
Part - A (Short Answer Questions)			
1	Summarize the applications of synchronizing circuits	Remember	4
2.	How are accumulators used in hydraulic circuits.	Remember	4
3.	Draw the symbols of flow control valves, pressure control valves.	Remember	4
4.	Explain regenerative circuit.	Remember	4
5.	Explain the usage of check valves in hydraulic circuit.	Remember	4
6.	Describe the criteria of selection of hydraulic pump.	Remember	4
7.	Classify the accumulator in hydraulic system.	Remember	4
Part – B (Long Answer Questions)			
1.	Describe the meter-in and meter-out in hydraulic system with a neat sketch.	Understand	4
2.	Describe the sequencing and synchronizing circuit in hydraulic system with a neat sketch.	Understand	4
3.	Describe standard in circuit diagram representation.	Understand	4
4.	Differentiate between flow control valve and pressure control valve.	Understand	4
5.	Differentiate Between meter-in and meter-out circuits.	Understand	4
6.	Differentiate linear and rotary accumulator in hydraulic	Understand	4

	systems.		
Part - C (Problem Solving and Critical Thinking Questions)			
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.	Apply	4
2.	Design a bleed-off circuit in pneumatic systems, write down the applications of bleed-off circuit.	Apply	4
3.	Design a hydraulic circuit with check valves. Explain the use of check valves. Merits, demerits and applications.	Apply	4
4.	Design a hydraulic circuit with directional control valve, solenoid valve with a neat sketches	Apply	4
5.	Design a hydraulic circuit with flow and pressure control valves with a neat sketch.	Apply	4
6.	What is an accumulator. State the application of accumulator. Explain the use of accumulator as leakage compensator with a hydraulic circuit.	Apply	4
UNIT-V AUTOMATION			
1	Write short notes on low cost automation.	Understand	5
2.	Summarize about PLC.	Understand	5
3.	Write short notes on micro controller.	Understand	5
4.	List out hydraulic equipments in automation.	Understand	5
5.	How maintenance and troubleshooting of pneumatic circuit is performed	Understand	5
6.	List out pneumatic equipments in automation.	Understand	5
7.	How maintenance and troubleshooting of hydraulic circuit is performed	Understand	5
8.	Summarize the advantages of low cost automation.	Understand	5
9.	Define microcontroller and its applications.	Understand	5
10.	Differentiate between PLC and microcontroller.	Understand	5
Part – B (Long Answer Questions)			
1	Briefly explain the use of microprocessor for sequencing.	Apply	5
2.	Explain low cost automation with a case study.	Apply	5
3.	Explain hydraulic and pneumatic equipment in automation	Apply	5
4.	Explain hydraulic equipment in automation with a circuit diagram.	Apply	5
5.	Explain troubleshooting of pneumatic circuit.	Apply	5
6.	Explain PLC in automation with a neat sketch, merits and demerits and applications.	Apply	5
7.	Summarize the steps involved in maintenance of hydraulic equipment	Apply	5
8.	Explain relay circuit in hydraulic system with a line diagram.	Apply	5
Part - C (Problem Solving and Critical Thinking Questions)			
1.	Explain LSA with a case study, merits demerits and applications.	Apply	5
2.	Explain PLC and logical gates in PLC with examples.	Apply	5
3.	Differentiate between LCA and microcontroller.	Apply	5
4.	Explain use of microcontroller for sequencing, Explain how microcontroller is used in automation, with a neat sketch, applications	Apply	5
5.	Explain functioning of relay circuit. How it is used in automation.	Apply	5
6.	Describe the maintenance schedules and troubleshooting procedures for pneumatic circuits.	Apply	5

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