K.RAMAKRISHNAN
COLLEGE OF TECHNOLOGY
An Autonomous Institution
Affiliated to Anna University Chennai, Approved by AICTE New Delhi,
ISO 9001:2015 & ISO 14001:2015 Certified Institution, Accredited with 'A+' grade by NAAC
Samayapuram, Tiruchirappalli – 621 112, Tamilnadu, India.

Department of Mechanical Engineering
(NBA Accredited)

Question Bank

Semester	:	VII
Subject Code	:	OAN751
Subject Name	:	LOW-COST AUTOMATION
Regulations	:	R2017
Academic Year	:	2021 – 2022
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UNIT - II : AUTOMATION USING HYDRAULIC SYSTEMS

Syllabus: Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators, intensifiers, etc. - Selection of hydraulic fluid, practical case study on hydraulic circuit design and performance analysis - Servo valves, electro-hydraulic valves, proportional valves, and their applications

Objectives: To give basic knowledge about automation
To understand the basic hydraulic and pneumatic systems for automation
To understand assembly automation.

Outcomes: To Understand the basic hydraulic system for automation (Understanding)

PART-A

S.No.	*Questions*	*Knowledge Level*	*Competence*
1	Define priming	K1	Remembering
2	Define Gerotor Motor	K1	Remembering
3	Define Pascal law	K1	Remembering
4	Outline the drawbacks of fluid power	K2	Understanding
5	Explain the term Actuators.	K2	Understanding
6	Classify Hydraulic actuators.	K4	Analyzing
7	Classify Cylinder types.	K4	Analyzing
8	Explain Cylinder Cushioning	K2	Understanding
9	Compare between hydraulic pump and motor	K5	Evaluating

10	Compare between Electric and Hydraulic Motor	K5	Evaluating
11	List the types of Hydraulic Motors	K1	Remembering
12	List the Control components in Hydraulic systems.	K1	Remembering
13	Classify Directional control valves	K2	Understanding
14	Explain positive displacement pumps	K2	Understanding
15	Explain non-positive displacement pumps	K2	Understanding
16	List the primary function of hydraulic fluid.	K1	Remembering
17	Compare fixed and variable displacement pumps	K2	Understanding
18	Classify any four applications of fluid power systems in automation.	K4	Analyzing
19	Sketch the graphical symbol of variable displacement reversible pump and telescopic cylinder.	K1	Remembering
20	List the classification of positive displacement pumps	K1	Remembering
21	State the formula for volumetric efficiency and mechanical efficiency.	K1	Remembering
22	Sketch the graphic symbol for (i) single acting spring return cylinder (ii) double-acting cylinder (iii) telescopic single-acting cylinder	K1	Remembering
23	Compare definitions and types of accumulators.	K2	Understanding
24	List few applications of accumulators		
25	State the definition of the fail-safe circuit.	K2	Understanding
26	Draw and define the working of the diaphragm accumulator.	K1	Remembering
27	Draw the circuit for using the accumulator as a Hydraulic Shock Absorber.	K2	Understanding
28	The small piston of a hydraulic lift has an area of 0.20 m^2. A car weighing 1.2 x 104 N sits on a rack mounted on the large piston. The large piston has an area of 0.90 m^2. How large force must be applied to the small piston to support the car?	K1	Remembering
29	Calculate the absolute pressure at an ocean depth of 1.0×10^3 m. Assume that the density of the water is 1.025×10^3 kg/m^3 and that $P_0 = 1.01 \times 10^5$ Pa.	K3	Applying

30	Why is hydraulic power especially useful when performing heavy work?	K1	Remembering
31	List five advantages and disadvantages of hydraulics.	K1	Remembering
32	Define the term fluid power	K1	Remembering
33	What is the main difference between an open-loop and a closed-loop fluid power system?	K1	Remembering
34	List any five applications of fluid power systems.	K1	Remembering
35	Recall the types of accumulators used in a hydraulic system.	K1	Remembering
36	Recall the definition of the proportional control valve.	K1	Remembering
37	What is cavitations in a pump?	K1	Remembering
38	Draw the symbol for the 3/2 Direction Control Valve.	K1	Remembering
39	Compare single-acting and double-acting cylinder	K2	Understanding
40	Define Intensifier, actuator and accumulator.	K2	Understanding

PART-B

S.No.	***Questions***	***Mapping***	***Competence***
1	Interpret in detail the types, constructions, and applications of cylinders in hydraulic systems.	K2	Understanding
2	Interpret in detail the classification of Directional control valves.	K2	Understanding
3	What are the required properties of good hydraulic fluid	K1	Remembering
4	What are the basic components that are required for a hydraulic system? Explain their functions.	K1	Remembering
5	How will you measure the pump performance? Explain each with a suitable example	K1	Remembering
6	How do you classify pumps? Explain the working of pumps with suitable sketches.	K1	Remembering
7	Explain the process of analyzing the regenerative circuit with a neat sketch.	K2	Understanding
8	Present the sketch of a fail-safe circuit and explain the working process in detail.	K2	Understanding

9	Formulate the various equations followed in estimating the various forces acting on the hydraulic actuators.	K6	Creating
10	Formulate the equations used for estimating the various performance parameters of a hydraulic motor.	K6	Creating
11	State and explain the different types of pressure control valves.	K4	Analyzing
12	Hydrostatic transmission operating at 70 bar pressure has the following characteristic for the pump and the motor: **Pump :** Capacity of pump, CP = 82 cm3/ rev (pump displacement) Volumetric efficiency of pump, ηVP = 82 % Mechanical efficiency of pump, ηMP = 88 % Speed of pump , N = 500 rev / min **Motor:** Capacity of motor, CM = ? Volumetric efficiency of motor, ηVM = 92 % Mechanical efficiency of motor, ηMM = 90 % Desired speed of motor , N = 400 rev / min Estimate the value of Actual Torque, Ta = ?	K4	Analyzing
13	Interpret in detail the working of hydraulic accumulator types with neat sketches for each type.	K2	Understanding
14	Discuss the various performance characteristics to be considered while selecting a proportional control valve.	K6	Creating
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PART-C

S.No.	*Questions*	*Mapping*	*Competenceh*

1	A pump supplies oil at 20 gpm to a 2-in. diameter double acting hydraulic cylinder. If the load is 1000 lb 9extending and retracting) and the rod diameter is 1 in., evaluate I. hydraulic pressure during the extending stroke II. piston velocity during the extending stroke III. cylinder horsepower during the extending stroke IV. piston velocity during the retraction stroke V. cylinder horsepower during the retraction stroke.	K5	Evaluating
2	State and explain the application of Mechanical-Hydraulic servo system in an automotive industry. Also present the hydraulic circuit sketches required.	K2	Understanding
3	List & explain the various components used in a basic hydraulic system. Apply the same concept to a simple hydraulic circuit and Interpret the working in detail.	K5	Evaluating
4	Explain for shaping applications using hydraulic circuits.	K5	Evaluating
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