

REFERENCE BOOKS:

1. **Theory of Vibration with Applications**, W. T. Thomson, M. D. Dahleh and C. Padmanabhan, Pearson Education Inc, 5th edition, 2008.
2. **Mechanical Vibrations**: S. Graham Kelly, Schaum's outline Series, Tata McGraw Hill, Special Indian Edition, 2007.
3. **Theory and Practice of Mechanical Vibrations**: J. S. Rao & K. Gupta, New Age International Publications, New Delhi, 2001.
4. **Mechanical Vibrations**, G. K. Grover, Nem Chand and Bros, 6th edition, 1996.

HYDRAULICS AND PNEUMATICS

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|--------------|----------|------------|-------|
| Subject Code | : 10ME73 | IA Marks | : 25 |
| Hours/Week | : 04 | Exam Hours | : 03 |
| Total Hours | : 52 | Exam Marks | : 100 |

PART – A

UNIT -1

Introduction to Hydraulic Power: Definition of hydraulic system, advantages, limitations, applications, Pascal's law, structure of hydraulic control system, problems on Pascal's law.

The source of Hydraulic Power: Pumps Classification of pumps, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump Selection factors, problems on pumps.

07 Hours

UNIT -2

Hydraulic Actuators and Motors: Classification cylinder and hydraulic motors, Linear Hydraulic Actuators [cylinders], single and double acting cylinder, Mechanics of Hydraulic Cylinder Loading, mounting arrangements, cushioning, special types of cylinders, problems on cylinders, construction and working of rotary actuators such as gear, vane, piston motors, Hydraulic Motor Theoretical Torque, Power and Flow Rate, Hydraulic Motor

Performance, problems, symbolic representation of hydraulic actuators (cylinders and motors).

06 Hours

UNIT - 3

Control Components in Hydraulic Systems: Classification of control valves, Directional Control Valves- Symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid and pilot operated DCV, shuttle valve, check valves, Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves - compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation.

07 Hours

UNIT - 4

Hydraulic Circuit Design And Analysis: Control of Single and Double - Acting Hydraulic Cylinder, Regenerative circuit, Pump Unloading Circuit, Double Pump Hydraulic System, Counter balance Valve Application, Hydraulic Cylinder Sequencing Circuits, Automatic cylinder reciprocating system, Locked Cylinder using Pilot check Valve, Cylinder synchronizing circuit using different methods, factors affecting synchronization, Hydraulic circuit for force multiplication, Speed Control of Hydraulic Cylinder, Speed Control of Hydraulic Motors, Safety circuit, Accumulators, types, construction and applications with circuits.

06 Hours

PART – B

UNIT - 5

Maintenance of Hydraulic System: Hydraulic Oils - Desirable properties, general type of Fluids, Sealing Devices, Reservoir System, Filters and Strainers, wear of Moving Parts due to solid -particle Contamination, temperature control (heat exchangers), Pressure switches, trouble shooting.

06 Hours

UNIT - 6

Introduction to Pneumatic Control: Definition of pneumatic system, advantages, limitations, applications, Choice of working medium. Characteristic of compressed air. Structure of Pneumatic control System, fluid conditioners and FRL unit.

Pneumatic Actuators: Linear cylinder - Types, Conventional type of cylinder- working, End position cushioning, seals, mounting arrangements- Applications. Rod - Less cylinders types, working, advantages, Rotary cylinders- types construction and application, symbols.

07 Hours

UNIT-7

Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve, pressure control valves, flow control valves, types and construction, use of memory valve, Quick exhaust valve, time delay valve, shuttle valve, twin pressure valve, symbols. Simple Pneumatic Control: Direct and indirect actuation pneumatic cylinders, speed control of cylinders - supply air throttling and Exhaust air throttling and Exhaust air throttling.

Signal Processing Elements: Use of Logic gates - OR and AND gates in pneumatic applications. Practical Examples involving the use of logic gates, Pressure dependant controls- types - construction - practical applications, Time dependent controls principle. Construction, practical applications.

07 Hours

UNIT-8

Multi- Cylinder Application: Coordinated and sequential motion control, Motion and control diagrams. Signal elimination methods, Cascading method- principle, Practical application examples (up to two cylinders) using cascading method (using reversing valves).

Electro- Pneumatic Control: Principles - signal input and out put, pilot assisted solenoid control of directional control valves, Use of relay and contactors. Control circuitry for simple signal cylinder application.

Compressed Air: Production of compressed air- Compressors Preparation of compressed air-Driers, Filters, Regulators, Lubricators, Distribution of compressed air Piping layout.

06 Hours

TEXT BOOKS:

1. **"Fluid Power with Applications"**, Anthony Esposito, Sixth edition, Pearson Education, Inc, 2000.
2. **'Pneumatics and Hydraulics'**, Andrew Parr, Jaico Publishing Co

REFERENCE BOOKS:

1. **'Oil Hydraulic systems', Principles and Maintenance** S. R. Majurr, Tata McGraw Hill Publishing Company Ltd. - 2001
2. **'Industrial Hydraulics', Pippenger, Hicks"** McGraw Hill, New York
3. **'Hydraulic & Pneumatic Power for Production'**, Harry L. Stewart
4. **'Pneumatic Systems'**, S. R. Majumdar, Tata McGraw Hill Publish 1995
5. **Power Hydraulics'** Michael J Pinches & John G Ashby, Prentice Hall

OPERATION RESEARCH

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|---------------------|-----------------|-------------------|--------------|
| Subject Code | : 10ME74 | IA Marks | : 25 |
| Hours/Week | : 04 | Exam Hours | : 03 |
| Total Hours | : 52 | Exam Marks | : 100 |

PART- A**UNIT -1**

Introduction: Evolution of OR, definition of OR, scope of OR, application areas of OR, steps (phases) in OR study, characteristics and limitations of OR, models used in OR, linear programming (LP) problem-formulation and solution by graphical method.

04 Hours**UNIT -2**

Solution Of Linear Programming Problems: The simplex method-canonical and standard form of an LP problem, slack, surplus and artificial variables, big M method and concept of duality, dual simplex method.

08 Hours