

# AMM-18 HYDRAULIC MACHINES

## UNIT-1 IMPACT OF FREE JETS

- 1.1 Introduction, Force exerted on a Stationary Flat Plate Held Normal to the Jet, Force Exerted on a Stationary Flat Plate Held Inclined to the Jet,
- 1.2 Force Exerted on a Stationary Curved Plate, Force Exerted on a Moving Flat Plate Held Normal to Jet, Force Exerted on a Moving Plate Inclined to the Direction of Jet,
- 1.3 Force Exerted on a Curved Vane when the Vane is moving in the Direction of Jet, Jet Striking a Moving Curved Vane Tangentially at One Tip and Leaving at the Other,
- 1.4 Jet Propulsion of Ships, Highlights, Objective Type Questions, Theoretical Questions, Unsolved Examples.

## UNIT-2 HYDRAULIC TURBINES

- 2.1 Introduction, Classification of Hydraulic Turbines, Impulse Turbines – Pelton wheel, Construction and working of Pelton wheel/turbine, work done and efficiency of a Pelton wheel, Definitions of heads and efficiencies,
- 2.2 Design aspects of Pelton wheel, Reaction Turbine, Francis turbine, work done and efficiencies of a Francis turbine, working proportions of a Francis turbine,
- 2.3 Design of a Francis turbine runner, Advantages and disadvantages of Francis turbine over a Pelton wheel, Propeller and Kaplan turbines-Axial flow reaction turbines,
- 2.4 Propeller turbine, Kaplan turbine, Kaplan versus Francis turbine, Deriaz turbine, Tabular or bulb turbines, Runaway Speed, Draft Tube,
- 2.5 Draft tube theory, Types of draft tubes, Specific Speed, Unit Quantities, Model Relationship, Scale Effect, Performance Characteristics of Hydraulic Turbines,
- 2.6 Main or constant head characteristic curves, Operating or constant speed characteristic curves, Constant efficiency or ISO-efficiency or Muschel curves,
- 2.7 Governing of Hydraulic Turbines, Governing of reaction turbines, Cavitations, Selection of Turbines, Surge Tanks, and Highlights.

## UNIT-3 CENTRIFUGAL PUMPS

- 1.1 Introduction, Classification of Pumps, Advantages of centrifugal Pump over Displacement (Reciprocating) Pump, Component Parts of a Centrifugal Pump,
- 1.2 Work done by the Impeller (or Centrifugal Pump) on Liquid, Head of a Pump, Losses and Efficiencies of a Centrifugal Pump, Losses in centrifugal Pump,
- 1.3 Effect of outlet vane angle on manometric efficiency, Minimum speed for starting a Centrifugal Pump, Effect of variation of Discharge on the Efficiency,
- 1.4 Effect of Number of Vanes of Impeller on Head and efficiency, Working Proportions of Centrifugal Pumps, Multi-stage Centrifugal Pumps, Pumps in series,
- 1.5 Pumps in parallel, Specific speed, Model Testing and Geometrically similar Pumps, Characteristics of Centrifugal Pumps, Net Positive Suction Head (NPSH),
- 1.6 Cavitations in Centrifugal Pumps, Priming of a Centrifugal Pump, Selection of Pumps, Operational Difficulties in Centrifugal Pumps, Highlights,

#### **UNIT-4 RECIPROCATING PUMPS**

- 4.1 Introduction, Classification of Reciprocating Pumps, Main Components and Working of a Reciprocating Pump, Discharge, work done and power required to drive reciprocating Pump, Single-acting reciprocating pump,
- 4.2 Double acting reciprocating Pump, Co-efficient of Discharge and slip of Reciprocating Pump, Co-efficient of discharge, slip, Effect of Acceleration of Piston on Velocity and Pressure in the Suction and Delivery Pipes,
- 4.3 Indicator Diagrams, Ideal indicator diagram, Effect of acceleration in suction and delivery pipes on indicator diagram, Effect of friction in suction and delivery pipes on indicator diagram, Effect of friction and acceleration in suction and delivery pipes on indicator diagram, Air vessels, Highlights.

#### **UNIT-5 MISCELLANEOUS HYDRAULIC MACHINES**

- 5.1 Introduction, Hydraulic Accumulator, Hydraulic Intensifier, Hydraulic Press, Hydraulic Crane, Hydraulic lift, Hydraulic Ram,
- 5.2 Hydraulic Coupling, Hydraulic Torque converter, Air Lift Pump, Jet Pump, Highlights.

#### **UNIT-6 WATER POWER DEVELOPMENT**

- 6.1 Hydrology, Definition, Hydrologic cycle, Measurement of run-off, Hydrograph, Flow duration Curve, Mass Curve, Hydro-power Plant, Introduction,
- 6.2 Application of hydro-electric power plants, Advantages and disadvantages of hydro-electric power plants, Average life of hydro-plant components,
- 6.3 Hydro-plant controls, Safety measures in hydro-electric power plants, Preventive maintenance to hydro-plant,
- 6.4 Calculation of available hydro-power, Cost of hydro-power plant, Hydro-power development in India, Combined hydro and steam power plants,
- 6.5 Comparison of hydro-power station with thermal power stations, Highlights

#### **Reference Books:**

1. Hydraulic Machines: Fluid Machinery by R K Singal and Mridul Singal
2. Fluid Machinery: Hydraulic Machines by Sadhu Sing
3. Vibration of Hydraulic Machinery (Mechanisms and Machine Science) by Yulin Wu and Shengcai Li