AMMV02 MARINE HYDRAULIC AND FLUID MACHINERY

UNIT-1 FLUID STATICS

1.1 Properties of fluid- pressure head

1.2 Pascal s law- absolute and gauge pressures- measurement of pressure- manometers (single, U-tube, differential),

1.3 Mechanical gauges- Hydrostatic forces on a submerged plane and curved surfaces- centre of pressure

1.4 Buoyancy and Floatation- Meta-centric height- stability of floating and submerged bodies.

UNIT-2 FLUID KINEMATICS AND DYNAMICS

2.1 Kinematics: Types of fluid flow- Types of flow lines- rate of flow- continuity equation- circulation and vorticity

2.2 Stream function, velocity potential- equipotent line- Cauchy Riemann equations- flow nets.

2.3 Dynamics: Euler s Equation of motion-

2.4 Bernoulli's equation- applications- venturimeter, orifice meter, pilot tube- free liquid jet- impulse momentum equation

2.5 Coriolis co-efficient –flow through an orifice- Torricelli s theorem – hydraulic coefficients.

UNIT-3 LAMINAR AND TURBULENT FLOWS

3.1 Reynold s experiment- critical Reynolds number- Rotating Viscometer- Navier- stokes equations of motion- relation between shear stress and pressure gradient- flow of viscous fluid in circular pipes

3.2 Haigen poiseuille s equation- turbulent flow-

3.3 Darcy weisbach equation- major and minor energy losses- pipes in series and parallel

3.4 Power transmission through pipes- boundary layer- characteristics- thickness- total drag due to laminar and turbulent layer- boundary layer separation and its control.

UNIT-4 PUMPS

4.1 Rotodynamic pumps- principles of dimensional analysis.

4.2 Buckingham's theorem

4.3 Important dimensionless numbers applicable to fluid mechanics- impact of jets- force exerted by a jet on flat, curved plates and pipe bends.

4.4 Surge pressure and control- centrifugal pumps- some definitions- pump output and efficiencies- effect of vane angle- cavitation-

4.5 Constructional details, pump characteristics, multistage pumps.

4.6 Axial flow pumps- characteristics- constructional details, non-dimensional parameters- efficiencies. Vibration & noise in hydraulic pumps.

UNIT-5 HYDRAULIC TURBINES

5.1 Classification of hydraulic turbines

5.2 Pelton turbines, velocity triangle- efficiencies- non dimensional numbers,

5.3 Working principle of the pelton wheel.

5.4 Francis and kaplan turbines- velocity triangles, efficiencies of the draft tubes, hydraulic turbine characteristics.

References Books:

1. Roberson, J.A. and Crowe C.T., "Engineering Fluid Mechanics", 6th Edition, John wiley, 1999.
2. Narayana Pillai,N,"Principles of Fluid Mechanics and Fluid Machines",3rd Edition, University Press, 2013
3. James A. Fay, "Introduction to Fluid Mechanics", PHI Learning Pvt. Ltd.,1994
4. Anthony Esposito, " Fluid Power with Applications",6th Ed. Pearson, 2003