Applied Fluid Mechanics (2160602)

IMP QUESTIONS

Module 1 – Flow through pipes

1. Derive Darcy Weisbach formula for the loss of head due to friction in pipe line.
2. Derive an expression for the loss of head due to sudden enlargement of a pipe.
3. Enlist the major and minor loses in pipes. Derive the expression for loss of head due to sudden contraction.
4. Explain the terms: Pipes in parallel and Equivalent pipe.
5. Explain hydraulically smooth and rough pipes
6. Derive the Hagen-Poiseuille equation and state the assumptions made.
7. Prove that the velocity distribution for viscous flow between two parallel plates when both plates are fixed across a section is parabolic in nature.
8. Enlist the important applications of Navier-stoke equations
9. Define (i) Cavitation (ii) Prandtl Mixing length (iii) Water Hammer (iv)) Total energy line (v) Hydraulic gradient line
10. What is couette flow? Derive an expression of velocity and shear stress for couette flow.
11. Examples based on above theories.

Module 2 – Boundary Layer

1. Explain laminar boundary layer.
2. Explain boundary layer theory and derive Karman's momentum equation for boundary layer.
3. Explain boundary layer separation. Also discuss the effect of pressure gradient on boundary layer separation.

Module 3 – Open Channel Flow

1. Prove that for trapezoidal channel of most economical section half of top width is equal to length of one of the sloping side.
2. Define: Critical flow, Critical depth, Alternate depth, Subcritical flow. Draw the specific energy curve for constant discharge in an open channel.
3. Define the most economical channel section and Discuss the importance of it.
4. Explain in brief types of flow in open channel.
5. Derive the equation for gradually varied flow. Discuss the assumptions made for the derivation.
6. Derive the Chezy's and Manning's formula in case of open channel flow.

7. Write the assumptions made in derivation of the Dynamic Equation of the Gradually varied flow.
8. Examples

Module 4 – Turbo Machinery

1. Compare Impulse turbine and Reaction Turbine.
2. Explain construction and working of a pelton wheel, Francis & Kaplan turbine.
3. Define: Volumetric efficiency, mechanical efficiency, hydraulic efficiency, Overall Efficiency, Gross head and Net head
4. What is a draft tube? Discuss its functions.
5. What is cavitation? What are its effects? Give necessary precaution against cavitation in pumps.
6. Give detail classification of Pumps
7. Examples

Module 5 – Dimensional Analysis and Similitude

1. Explain Froude model law. Obtain scale ratio for time, acceleration and discharge for the Froude model law.
2. Explain the Buckingham's π-theorem in dimensional analysis.
3. Explain the various types of similarities exist between model and its prototype.
4. Prove that the resistance F of sphere of diameter d moving at a constant speed v through a fluid of density ρ and dynamic viscosity μ may be expressed as

$$F = \frac{\mu^2}{\rho}\,\phi\left(\frac{vd\rho}{\mu}\right)$$

5. Example similar to Example 5.