ANNA UNIVERSITY OF TECHNOLOGY, COIMBATORE

B.E / B.TECH. DEGREE EXAMINATIONS : NOV / DEC 2010

REGULATIONS : 2008

THIRD SEMESTER

080180007 - FLUID MECHANICS AND MACHINERY

(COMMON TO AERONAUTICAL / MECHANICAL / AUTOMOBILE ENGG.)

TIME : 3 Hours Max. Marks : 100

PART - A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. Define Specific Gravity of a Fluid.
2. What is the effect of temperature on Viscosity?
3. State Some of the applications of Bernoulli's Equation.
4. Define Specific Weight.
5. What are all the normal boundary conditions assumed in case of a laminar flow ?
6. State some of the minor losses in a pipe flow.
7. State the expression for the loss of head at sudden expansion in a pipe flow.
8. What are all the differences between "Pipes in Series" and "Pipes in Parallel" ?
9. State Buckingham's Pi Theorem.
10. Enumerate the conditions for similarity between model and Prototype.
11. What is meant by Kinematic Similarity ?
12. Reynold's Number is a dimensionless parameter.-State True or False
13. Define Hydraulic Efficiency of a turbine.
14. Write the Formula for Euler's Turbine Equation.
15. What is meant by governing of Hydraulic turbines ?

16. What are all the differences between Impulse turbine and Reaction turbine ?
17. What are all the advantages of installing air vessels ?
18. What is the main application of a Gear pump ?
19. What are all the main types of "Rotory Pumps" ?
20. What is the main difference between Pump and Turbine ?

PART - B

(5 x 12 = 60 Marks)

ANSWER ANY FIVE QUESTIONS

21.(a) The 8 mm gap between two large vertical parallel plane surfaces is filled with a liquid of dynamic viscosity 2×10^{-2} Ns/m^2. A thin sheet of 1 mm thickness and 150 mm × 150 mm size, when dropped vertically between the two plates attains a steady velocity of 4 m/s. Determine weight of the plate. Assume that the plate moves centrally. (6)

(b) Explain the different types of Fluids . (6)

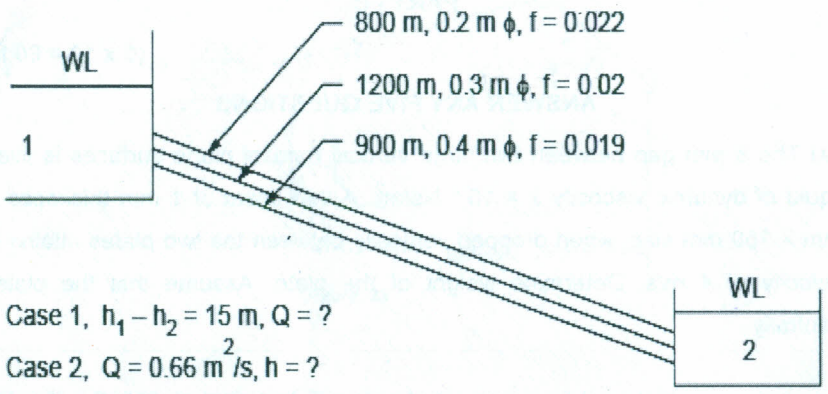
22. The details of a parallel pipe system for water flow are given below.

No.	length, m	Diameter, m	Friction factor
1	800	0.2	0.022
2	1200	0.3	0.02
3	900	0.4	0.019

Contd..Q.No.22

1. If the frictional drop between the junctions is 15 m of water, determine the total flow rate
2. If the total flow rate is 0.66 m3/s, determine the individual flow and the friction drop.

   The system is shown in the below diagram.



23. The pressure drop ΔP per unit length in flow through a smooth circular pipe is found to depend on (i) the flow velocity, u (ii) diameter of the pipe, D (iii) density of the fluid ρ, and (iv) the dynamic viscosity μ. Using Buckingham's π theorem method, evaluate the dimensionless parameters for the flow .

24. A Francis turbine developing 16120 kW under an a head of 260 m runs at 600 rpm. The runner outside diameter is 1500 mm and the width is 135 mm. The flow rate is 7 m^3/s . The exit velocity at the draft tube outlet is 16 m/s. Assuming zero whirl velocity at exit and neglecting blade thickness, determine the overall and hydraulic efficiency and rotor blade angle *at inlet*. Also find the guide vane outlet angle.

25. The following details refer to a centrifugal pump. Outer diameter : 30 cm. Eye diameter: 15 cm. Blade angle at inlet: 30°. Blade angle at outlet: 25°. Speed 1450 rpm. The flow velocity remains constant. The whirl at inlet is zero. Determine the work done per kg. If the manometric efficiency is 82%, determine the working head. If width at outlet is 2 cm, determine the power. η_o = 76%.

26. In a single acting reciprocating pump with plunger diameter of 120 mm and stroke of 180 mm running at 60 rpm, an air vessel is fixed at the same level as the pump at a distance of 3 m. The diameter of the delivery pipe is 90 mm and the length is 25 m. Friction factor is 0.02. Determine the reduction in accelerating head and the friction head due to the fitting of air vessel.

27. Derive the Darcy-Weisbach Equation and state the assumptions made.

28. State and Derive Bernoulli's Equation for Fluid flow. What are the limitations of Bernoulli's theorem also.

****THE END****