Code No. : 5030

FACULTY OF ENGINEERING
B.E. 3/4 (Civil) I Semester (Main) Examination, December 2011
FLUID MECHANICS – II

Time : 3 Hours] [Max. Marks : 75

Note : *Answer* ***all*** *questions from Part* ***A****, answer* ***any five*** *questions from Part* ***B****.*

PART – A **(25 Marks)**

1. Classify various types of hydraulic jumps. **3**
2. State the characteristics of flow profiles. **3**
3. What do you understand by backwater effect and afflux ? **3**
4. State the various applications of dimensional analysis as a tool in experimental hydraulics. **3**
5. Define the following terms in pumps :
   a) Overall efficiency
   b) Manometric efficiency. **3**
6. State the significance of most economical channel cross-section. **2**
7. Enumerate the various characteristics of flow profiles. **2**
8. State Buckingham's π-theorem. **2**
9. In a laminar boundary layer the nominal thickness varies with the longitudinal distance 'X' as _____. **2**
10. A double jet pelton wheel produces 5000 kW power under a head of 300 mts. If a specific speed of 20 is available. Compute the speed of turbine. **2**

PART – B **(50 Marks)**

11. a) Explain in detail with sketches the pressure and velocity distribution in an open channel. **5**
    b) A trapezoidal channel has a side slope of 1 horizontal to $1^1/_2$ vertical and the side slope of the bed is 1 in 2000. The area of the cross-section is 55 m^2. If Chezy's constant 'C' is 60. Determine the dimensions of the section discharge for the most economical section. **5**

12. a) Derive the momentum equation for a jump in horizontal rectangular channel. 5

    b) A rectangular channel 10 m wide with a break in its bottom slope from 0.01 to 0.0064 carries a discharge of 125 m^3/s. Determine the nature of the surface profile and compute its length. Take n = 0.015. 5

13. a) For the velocity profile in laminar boundary layer given as $\frac{u}{U} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^2$. Determine the thickness of the boundary layer and shear stress at 1.80 m from the leading edge of plate. The size of the plate is 3.0 m long and 1.75 m wide and velocity of flow is 0.175 m/s, viscosity of water is 0.01 poise. 5

    b) Explain the significance of drag and lift forces. And also explain the stream line body and bluff body. 5

14. a) State Buckingham π-theorem. Why this theorem is considered superior to Rayleigh's method for dimensional analysis ? State the drawbacks of Rayleigh's theorem. 5

    b) A pipe of diameter 2.0 m is required to transport an oil of specific gravity 0.8 and viscosity 0.04 poise at the rate of 5.0 m^3/sec. Tests were conducted on a 25 cm dia pipe using water at 20°C. Determine the velocity and rate of flow in the model. Viscosity of water at 20°C is 0.01 poise. 5

15. a) Draw a neat sketch of velocity triangle for reaction turbine and derive an expression for work done. 5

    b) The axis of a centrifugal pump is 3 m above the water level in the sump and static lift from the pump centre is 35 m. The friction loss in the suction and delivery pipes are 1 m and 8 m respectively. The suction and delivery pipes are each 15 cm in diameter. The impeller is 30 cm in diameter and 1.5 cm wide at outlet and its speed is 1700 rpm. The water at inlet has radial flow and the blade angle at outlet is 30° to the tangent to the periphery. Calculate the power to be supplied and discharge assuming a manometric efficiency of 77% and mechanical efficiency of 72%. 5

16. a) Explain the significance of Boundary layer separation. 5

    b) Prove that the loss of head due to jump is $h_L = \frac{(Y_2 - Y_1)^3}{4Y_1Y_2}$, where Y_1 and Y_2 are the pre-jump depth and post-jump depth respectively. 5

17. Write short notes on the following :

    a) Principle of stream lining. 3

    b) Surges in open channels. 3

    c) Water hammer phenomenon. 4