Code No. 2324 / N

FACULTY OF ENGINEERING

B.E. 3/4 (Civil) I – Semester (New) (Main) Examination, Nov. / Dec. 2012

Subject : Fluid Mechanics – II

Time : 3 hours **Max. Marks : 75**

***Note**: Answer all questions from Part–A and answer any **FIVE** questions from Part–B.*

PART – A (10 x 2 ½ = 25 Marks)

1. Classify the various types of uniform and non-uniform flows.
2. Enumerate various conditions under which a hydraulic jump can occur.
3. Water flows through a rigid pipe with a velocity of 0.85 m/s. The length of the pipe is 3250m and the 'K' value of water is 2.2×10^3 MPa. Compute the critical time of closure of valve.
4. Differentiate between a dimensionless constant and a dimensioned constant. Give examples.
5. Why are hydraulic losses less in a Kaplan turbine than in a Francis Turbine?
6. Explain the terms : Manometric Efficiency and Mechanical Efficiency as applicable to a Centrifugal Pump.
7. State the various applications of critical depth.
8. How does a boundary layer produce momentum change? How is this related to boundary resistance?
9. Show that for critical flow at a section the Froude's number is equal to unity.
10. Explain three kinds of similitude.

PART – B (5 x 10 = 50 Marks)

11.a) Derive an expression for the most economical section of r a trapezoidal channel sections half of the top width is equal to one of the sloping side.

b) The bed of a stream has a slope of 1 in 1000, and the depth of water is 1.5m. A dam has to be built across the stream and provided with a sluice gate. Find the height of the dam so that the rise in the level of water when the sluice gate is closed may be limited to 3.25m. Take C = 40 in the formula using Chezy's formula, the coefficient of discharge of the dam as a weir, 0.56 and assume, in calculating m, that the breadth of the stream is large in comparison with the depth.

12.a) Define a Surge and give it classification. Also derive the equation for positive surge moving upstream.

b) Water flows in a rectangular channel at a depth of 0.75 m and a velocity of 13.5m/sec. Find the following i) The alternate depth at this discharge ii) The conjugate depth at this discharge and iii) The head loss in the jump if the jump takes place at this section.

13.a) A 1.80m long, 300 mm wide plate moves in water at 2.60m/s. Assuming a velocity distribution $\frac{u}{U} = \left(\frac{y}{\delta}\right)^{1/4}$ in the boundary layer, find the drag resistance if the thickness of the boundary layer is 56mm at the trailing end. Find also the drag coefficient.

b) Mention few practical applications of boundary layer flows over a flat plate. Also state the effects of boundary layer.

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14.a) Explain Rayleigh's method of obtaining relation between a given set of variables influencing a phenomenon.

b) Assuming that the same fluid at same temperature is to be used in the model and prototype, what is the force ratio for the various similarity criteria

i) Reynolds, ii) Froude, iii) Mach and iv) Weber.

15.a) Define a centrifugal pump. Describe the principle and working of a centrifugal pump with a neat sketch.

b) An inward radial flow reaction turbine runner is required to operate under a head of 11.5m at a speed of 180rpm and to develop 1500kW. Find the diameters of the runner at the inlet and outlet, the discharge, guide blade angle and the runner vane angles at the inlet and outlet. Assume speed ratio as 0.75, flow ratio as 0.16, velocity of flow constant, hydraulic efficiency as 0.87 and overall efficiency as 0.80.

16.a) Brief the procedure for computation of gradually varied flow profile using direct step method.

b) What do you understand by governing of turbine? Explain by means of neat sketches, the method of governing of Pelton Wheel.

17. Write short notes on the following :

a) Impact of jet vanes

b) Energy dissipation in Hydraulic Jump

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