Code No. : 5030/S

# FACULTY OF ENGINEERING
## B.E. 3/4 (Civil) I Semester (Suppl.) Examination, June 2012
## 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. Define specific energy and critical flow. 2

2. An elementary wave can travel upstream in a channel with 1.0 m depth and 2 m/s velocity, with a velocity ; 2
   a) 5.132 m/s
   b) 1.132 m/s
   c) 3.132 m/s
   d) 2.132 m/s.

3. What are the uses of dimensional analysis ? 3

4. Define stream lining. 2

5. Explain the purpose of providing scroll casing for a reaction turbine. 2

6. Define different efficiencies of a centrifugal pump. 3

7. Define displacement thickness and momentum thickness. 3

8. A ship model of scale 1 : 100 has a wave resistance of IN at its design speed. The corresponding wave resistance in prototype will be ; 2
   a) 1000 N
   b) 10000 N
   c) 100000 N
   d) 1000000 N.

9. Explain in detail, the classification of surface profiles. 3

10. Explain the significance of channels of most efficient section. 3

## PART – B (50 Marks)

11. a) State the conditions under which the rectangular section of an open channel will be most economical. Derive these conditions. 5

b) A trapezoidal channel having bottom width 6 m and side slopes 2 H : 1 V is laid on a bottom slope of 0.0016. If it carries a uniform flow of water at the rate of 10000 H/sec, compute the normal depth and the mean velocity of flow. Take Manning's n = 0.025. 5

12. a) State clearly the procedure involved in the determination of gradually varied flow profile by step method. 5

b) In a horizontal rectangular channel 1.5 m wide, if the observed depths before and after the jump are 0.2 m and 1.0 m respectively, determine the discharge flowing through the channel. 5

13. a) Explain the outline of the procedure for Buckingham method of Dimensional analysis. 5

b) The equation for specific speed for a turbine is given by $N_S = \frac{N\sqrt{P}}{H^{5/4}}$. By $\pi$-theorem and using variables such as power 'P', speed 'N', head 'H', diameter 'D' of the turbine, density '$\rho$' of the fluid and acceleration due to gravity 'g', deduce the above expression for $N_S$. 5

14. a) Explain the characteristics of laminar and turbulent boundary layer. What are the factors affecting the boundary layer thickness ? 5

b) A flat plate 1 m wide and 1.5 m long is rowed length wise through still air with a velocity of 10 m/s. Assuming the boundary layer to be fully laminar, estimate its thickness at the trailing edge. Mass density and kinematic viscosity of the air are 1.216 kg/m$^3$ and $0.15 \times 10^{-4}$ m$^2$/sec respectively. Also calculate the shear stress at that point. 5

15. a) State the advantages of centrifugal pumps over the reciprocating pumps. 5

    b) What is a surge tank and a forebay and what are their functions ? Describe with neat sketches different types of surge tanks. 5

16. a) A centrifugal pump of radial type delivers 5000 litres per minute against a total head of 38 m, when running at a speed of 1450 rpm. If the outer diameter of the impeller is 300 mm and its width at the outer periphery is 13 mm, find the vane angle to exist. Assume manometric efficiency as 80%. 5

    b) For a linear velocity distribution in the boundary layer on a flat plate, show that ; $(\delta^* / \theta) = 3$ and $(\delta_E / \delta) = 0.25$. 5

17. Write short notes on the following : 10

    a) Characteristics of surface profiles.

    b) Drag and its classification.