

FACULTY OF ENGINEERING

B.E. 3/4 (Civil) I – Semester (New) (Suppl) Examination, May 2013

Subject : Fluid Mechanics – II

Time : 3 hours

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

PART – A (10 x 2.5 = 25 Marks)

1. Find the maximum discharge for least excavation of a rectangular channel of 4.25m wide when $C = 60$ and bed slope is 1 in 1500.
2. Define gradually varied flow along with examples.
3. Explain the Water Hammer Phenomenon.
4. State the significance of drag and lift forces.
5. What are the various fields where models have their applications?
6. Differentiate between radial flow and parallel flow turbines. Give examples.
7. What are the non-dimensional factors adopted in the analysis of centrifugal pumps by principle of similarity?
8. Explain the terms : Wetted Perimeter and Hydraulic mean depth.
9. State the various factors affecting the boundary layer thickness.
10. Define the scale effect in models.

PART – B (5 x 10 = 50 Marks)

- 11.a) A concrete lined trapezoidal channel has to discharge 650 cumec. The side slopes are 1 : 1 and the bed slope is 1 in 3755. The permissible velocity is 2.75m/s. Determine the bottom width and the depth of the section. Take Manning's $n = 0.015$.
b) Explain by specific energy head diagram, that for a given value of the specific energy head there are two possible depths of flow for a given rate of discharge.
- 12.a) The loss of energy head in a hydraulic jump is 4.85m. The Froude number just before the jump is 8.0. Find the i) discharge per meter width of the channel, ii) the depths before and after the jump iii) Froude number after the jump iv) Percentage of loss of energy head due to jump and v) Length of the jump.
b) Explain in detail about various gradually varied flow profiles and their characteristics.

- 13.a) In a stream of oil of specific gravity 0.85 and kinematic viscosity 0.82 stoke, moving at 5 m/s a plate of 450 mm length and 250 mm width is placed parallel to the direction of motion. Calculate the frictional drag on one side of plate. Find also the thickness of the boundary layer and the shear stress at the trailing edge of the plate.
- b) Obtain an expression for pressure rise due to closure of valve at the end of pipe line i) When the valve is closed in an interval of time T ii) when the valve is instantaneously closed.
- 14.a) Explain different types of models and their scale ratios.
- b) The discharge characteristics of a spillway 17.5 m long are to be determined. It is designed to discharge 150 cumec at a head of 3.25 m. The supply available in the laboratory is 50.5 lt/sec. Calculate i) Prototype-model length ratio ii) Length of model spillway and iii) Head over the model spillway.
- 15.a) Explain in detail the significance of characteristics curves in turbine.
- b) A Pelton wheel is working under ahead of 50m and the rate of flow of water through the jet is 900 ℓ /s. Find the efficiency and power produced by the wheel if the jet is deflected by the bucket through an angle of 165° . Draw the velocity triangles. Take $C_v=0.98$.
- 16.a) Derive the dynamic equation of gradually varied flow and state its assumptions.
- b) Differentiate between open channel flow and pipe flow. Which is complicated and why?
17. Write short notes on the following :
- a) Boundary layer growth and separation
b) Draft tube and Penstock
