

R16

Code No: 134BA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, July/August - 2021

FLUID MECHANICS – II

(Common to CE, CEE)

Time: 3 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

1. A rectangular channel which is laid on a bottom slope of 0.0064 is to carry $20 \text{ m}^3/\text{s}$ of water. Determine the width of the channel when the flow is in critical condition. Take n as 0.01. [15]
- 2.a) Derive the equation for critical depth in terms of alternate depths.
b) A trapezoidal channel of the most economical section has a wetted perimeter of 16 m and depth of flow of 1 m. if the velocity is 1.5 m/s, Determine the discharge. [8+7]
3. A spillway model is to be built to a geometrically similar scale of 1/50 across a flume of 60 cm width. The prototype is 15 metres high and the maximum head on it is expected to be 1.5 metres.
a) What height of model and what head on the model should be used?
b) If the flow over the model at a particular head is 12 litres per second, what flow per meter length of the prototype is expected? [8+7]
4. For laminar flow in a pipe the drop in pressure Δp is a function of the pipe length L , its diameter D , mean velocity of flow V and the dynamic viscosity μ . Using Raleigh's method, develop an expression for Δp . [15]
- 5.a) Derive the equation for the force of impact of a fluid jet on a normal flat vane moving in the direction of jet and the vane velocity is less than jet velocity.
b) A horizontal jet of water of 5 cm diameter and velocity 40 m/s is deflected through an angle of 135° by a stationary curved vane. Assuming shockless and frictionless flow, determine the magnitude and direction of the resultant force on the vane. [8+7]
- 6.a) A jet of water moves smoothly over the surface of a curved vane. Analyse the forces acting on the vane and determine the resultant force in magnitude and direction. Assume shock less flow at entry and exit.
b) A jet of diameter 150mm strikes a flat plate normally with a velocity of 20m/sec. The plate is moving with a velocity of 5m/sec in the direction of the jet and away from the jet. Find: i) The force exerted by the jet on the plate ii) Work done by the jet on the plate per second. [8+7]
7. Draw a neat diagram of Kaplan turbine and explain its working. State important equations. [15]
8. A centrifugal pump has diameter of 50 cm and 25 cm. The speed is 1200 rpm. The impeller vanes are set back at an angle of 30° to the outer rim. The width at outlet is 1.8 cm. Manometric efficiency is 72%. The constant velocity of flow through the impeller is 2m/s. Determine the vane angle at inlet, work done by the impeller per second per unit weight of water. [15]

---ooOoo---