

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER-2015

Paper Code: ETCE-205

Subject: Fluid Mechanics.

Time: 3 Hours

Five

Maximum Marks: 75

Note: Attempt any questions including Q.No1 which is compulsory.

Q1 Attempt **any five** questions:-

(5x5=25)

- What is viscosity? What is the unit of viscosity in MKS & SI system?
- Define (i) Steady and unsteady flow.
(ii) Rotational and irrotational flow.
- What are the assumptions and limitations of Moment of Momentum equation?
- Explain Buckingham's Π theorem.
- What is the engineering significance of Dimensionless numbers?
- What are the applications of Bernoulli's equation?
- What are the different types of motion? Explain vorticity.

Q2 (a) What are thermodynamic properties of fluid?

(4)

- (b) A masonry dam 10 m high and 4 m wide, has water level with its top. Find
 (a) The total pressure on 1 m length of dam. (b) depth of center of pressure
 (c) the point at which resultant cuts the base. Density of masonry wall is 2000 kg/m^3 .

(8.5)

Q3 Velocity of a two dimensional flow is given by the equation

$$\vec{U} = (1 + 4xy + 2t^2) \mathbf{i} + (4x^2y + 7t) \mathbf{j}$$

Determine the velocity, convective acceleration, local acceleration and total acceleration at a position say P(2, 3 cm) after 4 seconds.

(12.5)

Q4 In a two dimensional flow in x-y plane $\psi = 3xy$ Prove that flow is irrotational. Also determine the corresponding velocity potential.

(12.5)

Q5 (a) Write down the Euler's equation for 3-D, inviscid flow.

(2.5)

- (b) Rate of flow of water through a Francis turbine is $0.75 \text{ m}^3/\text{sec}$. Inlet and outlet pressures at A & B are 175 KN/m^2 and -50 KN/m^2 . Determine the power delivered to the turbine by water. Neglect losses in turbine.

(10)

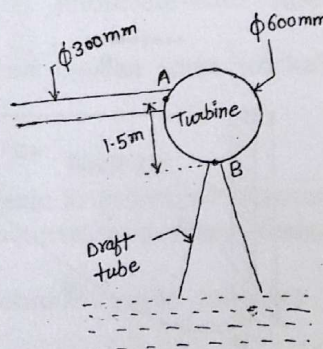


fig 51

Q6 An airplane wing 1 m chord moves through still air at 20°C at 180 Km/hr . A 1:15 scale model of this wing placed in wind tunnel with air blowing at 75 m/s at the same temperature as that in the flight. What should be the pressure in the tunnel?

(12.5)

Q7 Show by Dimensional analysis that power developed by a hydraulic turbine is given by

$$P = \rho N^3 D^5 f\left(\frac{N^2 D^2}{gH}\right)$$

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P/h

Where ρ is the mass density of fluid,
 N is speed of runner rotation in rpm
 D is diameter of runner
 H is working head
 g is gravitational acceleration.

(12.5)

Q8

A fire brigade man is holding a fire stream nozzle of 5 cm dia. The jet issues out with a velocity of 13 m/sec and strikes the window. Find the angle or angles of inclination with which the jet issues from the nozzle. What will be the amount of water falling on the window? (12.5)

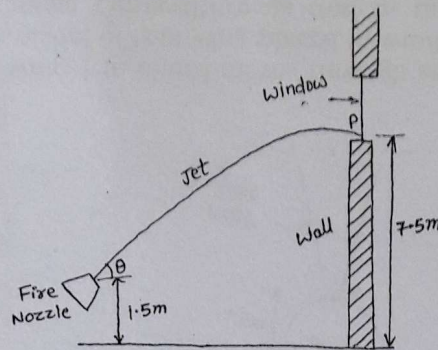


fig 8.1

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P2/2