Time: 3 hours **Marks: 80**

N.B.

1. **Question No. 1 is compulsory.**
2. **Attempt any Three Questions from the remaining questions.**
3. **Neat diagram must be drawn wherever necessary.**
4. **Assume suitable data if necessary and state clearly**.

Q.1 Answer any **four** of the following.

a What is effect of temperature on the Viscosity of water and air? 5

b A stream function is given by $\psi = 5x - 6y$. Calculate the velocity component also the magnitude and direction of the resultant velocity at any point. 5

c Explain the working of Orifice meter. 5

d Define Reynold's number and the significance. 5

e Define the terms: Major energy losses and minor energy losses in pipe. 5

Q.2 a A triangular plate of 1 meter base and 1.5 meter altitude is immersed in water. The plane of the plate is inclined of 30^0 with free water surface and the base is parallel to and at a depth of 2 meters from the water surface. Find the total pressure on the plate and the position of the center of pressure. 10

b Describe Buckingham's method or π – theorem to formulate a dimensionally homogenous equation between the various physical quantities a a certain phenomenon. 10

Q.3 a Describe expression for flow of viscous fluid through a circular pipe for velocity distribution across the pipe section. 10

b Water at the rate of 30 litres /sec is flowing through a 0.2 m. I.D pipe. A venturimetre of throat diameter 0.1 m is fitted in the pipeline. A differential manometer in the pipeline has an indicator liquid M and the manometer reading is 1.16 m. What is the relative density of the manometer liquid M? Venturi Co-efficient = 0.96; density of water = 998 kg/m^3. 10

Q.4 a Derive an expression for total pressure and the depth of the center of pressure from the free surface liquid inclined plane surface submerged in the liquid. 10

b 250 litres/ sec of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bent by 135^0, find the magnitude and direction of the resultant force on the bend. The pressure of the water flowing is 400 kNm^2. Take specific weight of water as 9.81 kN/m^3. 10

Q.5 a The diameter of a horizontal pipe which is 300 mm is suddenly enlarged to 600 mm the rate of flow through this pipe is 0.4 m^3/s. If the intensity of pressure in the smaller pipe is 125 kN/m^2. Determine: 10

i) Loss of head due to sudden enlargement
ii) Intensity of pressure in the larger pipe
iii)Power lost due to enlargement

b Explain Reynold's Transport Theorem with its proof. 10

Q.6 a Three pipes with details as following are connected in parallel between two points. 10

Pipe	Length	Diameter	*f*
1	1000 m	20 cm	0.02
2	1200 m	30 cm	0.015
3	800 m	15 cm	0.02

When the total discharge of 0.3 m^3/s flows through the system, calculate the distribution of discharge and head loss between the junction.

b Explain the Boundary Layer Separation and methods to avoid it. 10

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