Time : 3 Hours **Total Marks : 80**

NB:

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**.
5. **Appropriate figures** to the right indicate marks.

1		**Answer any four from the following**	**20**
	a.	The absolute viscosity of a liquid, having a specific gravity of 0.87, is 0.073 poise. Find its kinematic viscosity in m^2/s and in stokes.	**5**
	b.	Distinguish between rotational flow and irrotational flow. Give one example of each.	**5**
	c.	Discuss the relative merits and demerits of the venturimeter with respect to orifice meter.	**5**
	d.	What do you understand by Reynolds number? Mention its significance in fluid mechanics.	**5**
	e.	Which factors affect the thickness of laminar and turbulent boundary layers?	**5**
2	**a.**	A semicircular, 12 m diameter, a tunnel is to be built under a 45 m deep, 240 m long lake. Determine the magnitude and direction of total hydrostatic force acting on the roof of the tunnel.	**10**
	b.	Derive the equation of stream line for two-dimensional, steady, and compressible flow	**10**
3	**a.**	The stream function in a two-dimensional incompressible flow field is given by $\psi = x^3 - 3xy^2$. Find the velocity at a point (1,2) and the velocity potential function.	**10**
	b.	Define linear momentum and angular momentum and list out a few practical applications of each.	**10**
4	**a.**	An oil with density of 850 kg/m^3 and viscosity 0.16 Ns/m^2 flows through a 20 cm diameter pipe at a rate of 1.2 lit/sec. If the length of the pipe is 500m, find the pressure drop between the two ends of the pipe. Also calculate the shear stress at the pipe wall.	**10**
	b.	Derive a formula developed by Darcy for loss of head due to friction for the flow through a pipe.	**10**
5	**a**	Draw a diagram showing the relation between f, Re and D/€ for laminar and turbulent flow in pipe. Discuss the importance of € and implications also.	**10**
	b	Why are the pipes connected in parallel? What is the loss of head in pipes of same length which are connected in parallel.	**10**
6	**a**	An aeroplane is flying at a speed of 1000 km/hr at a particular altitude where the pressure is 0.75 bar and temperature is 270 K. Find the pressure, temperature and density of air at the stagnation point on the nose of the plane. Take $\gamma = 1.4$ and $R = 287$ Nm/kg-K for air.	**10**
	b	Write short note of any 2 for the following	**10**
		i) Define the term: Aerofoil, Chord Length, angle of attack and Span of an aerofoil.	**5**
		ii) What do you understand by the terms: Major Energy Loss and Minor Energy Losses in pipes?	**5**
		iii) Define Velocity potential function and stream function.	**5**
