(Three Hours) 80 Marks

N.B. (i) Question **No. 1** is compulsory

(ii) Attempt any **Three** Questions out of **Five** Questions

(iii) Illustrate with figures whenever necessary

(iv) Assume suitable data if necessary and state it clearly

1 **Solve any Four** [20]

a) Explain what is a Manometer? Give classification of Manometers

b) Define Specific weight, Specific gravity

c) Write two practical applications and limitations of Bernoulli's theorem

d) Explain Source, sink and doublet

e) Give classification of weirs

f) Explain capillarity and surface tension

2 (a) (i) Define viscosity and Derive SI unit of viscosity [5]

2 (a) (ii) A flat plate of area $3x10^6$ mm^2 is pulled with a speed of 1.5 m/s relative with another plate located at a distance of 0.15 mm from it. Find the force and power required to maintain this speed if the fluid separating them is having viscosity 1 poise. [5]

2(b) (i) Explain and Define Vapour pressure [5]

2(b) (ii) Find the surface tension in a soap bubble of 3 cm diameter when the internal pressure is 1.5 N/m^2 above atmospheric pressure. [5]

3 (a) (i) Explain Langragian approach and Eularian approach in fluid mechanics [5]

3 (a) (ii) A hollow cylinder of outer diameter 1m, inner diameter 0.75m, weighs 2**h** kN, where **"h"** is the height of cylinder. It is required to float in water with its longitudinal axis vertical. Calculate the height of cylinder [5]

3 (b) Derive an expression for the depth of center of pressure from free liquid surface for an inclined plane surface submerged in liquid [10]

4 (a)	A cubical tank has sides of 1.5 m. It contains water for the lower 0.6 m depth. The upper remaining part is filled with oil of specific gravity 0.9, Calculate the following for one vertical side of tank: (i) Total pressure (ii) Position of center of pressure and (iii) Draw a neat sketch showing position of center of pressure	[10]
4 (b)	Write Eular's equation of motion and Derive Bernoulli's equation from Euler's equation.	[10]
5 (a)	Water is flowing through a pipe having diameter 300 mm and 200 mm at the bottom and top respectively. The intensity of pressure at the bottom end is 35 N/cm^2 and the pressure at upper end is 12 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 60 lit/s.	[10]
5 (b)	Define velocity potential function and stream function with their mathematical expression and derive relation between the two.	[10]
6 (a) (i)	With a neat sketch Define Cipolletti weir, Derive expression for discharge over Cipolletti weir.	[6]
6 (a) (ii)	Explain Velocity of approach and Give expression for Discharge over a rectangular weir considering Velocity of approach.	[4]
6 (b)	A closed vessel contains water up to a height of 1.5 m and over the water surface there is air having pressure 7.848 N/cm^2 above atmospheric pressure. At the bottom of the vessel there is an orifice of diameter 18 cm. find the rate of flow of water from orifice. Take C_d=0.6	[10]

****