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SUBJECT CODE NO:- H-358
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Civil)
Fluid Mechanics-I
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- 1) Question no.1 and 6 are compulsory.
- 2) Attempt any two questions from each section.
- 3) Draw neat sketches whenever necessary.
- 4) Assume suitable data if necessary.

Section A

- Q.1 Answer the following (any five) 10
- a) Define Dynamic Viscosity and Kinematic Viscosity.
 - b) State Newton's law of viscosity and its application.
 - c) Define the term centre of buoyancy.
 - d) Define the term meta-centre and meta-centric height.
 - e) Explain the term laminar and turbulent flow
 - f) Give classification of manometers.
 - g) Define Surface tension and state its SI units.
- Q.2 A) Derive an expression for the force exerted on a sub-merged vertical plane surface by the static liquid and locate the position of centre of pressure. 08
- B) A rectangular plane surface 1m wide and 3m deep lies in water in such a way that its plane makes an angle of 30 degree with the free surface of water. Determine the total pressure force and position of centre of pressure, when the upper edge is 2m below the free surface. 07
- Q.3 A) Derive an expression for the meta centric height of a floating body. 08
- B) With neat sketches, explain the conditions of equilibrium for floating bodies and submerged bodies. 07
- Q.4 A) A 30 cm diameter pipe conveying water, branches into two pipes of diameter 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5m/s. Find the discharge in this pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2m/s. 06
- B) In a two dimensional incompressible flow, the fluid velocity components are given by $u = x - 4y$ and $v = -y - 4x$. Show that velocity potential exists and determine its form. 09
Find also the stream function.

Q.5 Answer the following question.

- A) Explain briefly working principle of bourdon pressure gauge with neat sketch. 07
 B) What is Hagen Poiseuille's formula? Derive an expression for Hagen Poiseuille's Formula 08

Section B

Q.6 Attempt any Five 10

- a) What is a venturimeter?
 b) Define Velocity approach.
 c) What do you mean by "Viscous flow"?
 d) What is Free jet of liquid?
 e) Enlist the forces acting on fluid in motion.
 f) What do you mean by Partially submerged Notch?
 g) What do you understand term "Boundary layer"?

Q.7 (A) Derive Bernoulli's equation from Fundamentals. 10
 (B) A pipeline carrying oil of specific gravity 0.87, changes in diameter from 200mm diameter at a position A to 500mm diameter at a position B which is 4m at a higher level. If the pressure at A and B are 9.81 N/cm^2 and 5.88 N/cm^2 respectively and discharge is 200lit/sec. determine the loss of head and direction of flow. 05

Q.8 (A) Obtain an expression for time of emptying a tank through an orifice at its bottom. 08
 (B) A tank has two identical orifices on one of its vertical sides. The upper orifice is 4m below the water surface and lower one is 6m below the water surface. If the value of C_v for each orifice is 0.90 Find the point of intersection of the two jets. 07

Q.9 (A) Find an expression for the discharge over triangular notch or weir in terms of head of water. 08
 (B) A rectangular orifice 0.9m wide and 1.2m deep is discharging water from a vessel. The top edge of orifice is 0.6m below the water surface in the vessel. Calculate the discharge through the orifice. If $C_d=0.6$ and percentage error if the orifice is treated as a small orifice. 07

Q.10 Write short note

- A) Differentiate between stream lines body and bluff body. 06
 B) What are advantages and disadvantages of triangular notch over rectangular notch. 03
 C) Obtain an expression for discharge through a large rectangular orifice. 06