Hall Ticket No | | | | | | | | | | | Course Code: ACEC03

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

B.Tech III SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - FEBRUARY 2023

Regulation: UG20

FLUID MECHANICS

Time: 3 Hours **(CIVIL ENGINEERING)** **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Summarize the following
   i) Density , ii) Specific volume
   iii) Specific gravity iv) Weight density. [BL: Understand| CO: 1|Marks: 7]

   (b) Determine the intensity of shear of an oil having viscosity of 1 poise. The oil is used for lubricating the clearance between a shaft diameter 10 cm and its journal bearing. The clearance is 1.5 mm and the shaft rotates at 150 rpm. [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) State and derive Pascal's law. Discuss the stability of floating body with neat sketches. [BL: Understand| CO: 2|Marks: 7]

   (b) A manometer connected to a pipeline, containing oil of specific gravity 0.8, is shown Figure 1. Find the pressure of oil in the pipe if A to B and B to C of the manometer is filled with Hg (S = 13.6). [BL: Apply| CO: 2|Marks: 7]

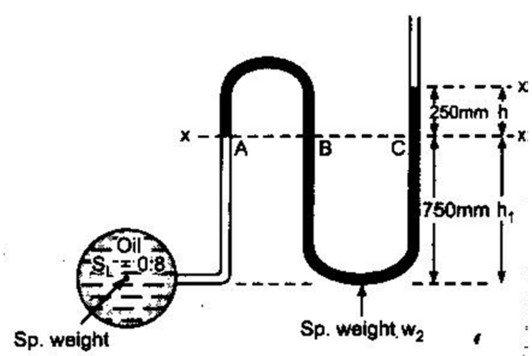

Figure 1

MODULE – III

3. (a) Explain about Reynold's number and Froude's number with their governing equations.
[BL: Understand| CO: 3|Marks: 7]

(b) A stream function is given by ψ= 5x-6y. Calculate the velocity components and also magnitude and direction of the resultant velocity at any point. [BL: Apply| CO: 3|Marks: 7]

4. (a) Write about flow net and show relationship between stream function and velocity function.
[BL: Understand| CO: 4|Marks: 7]

(b) A pipe 50 cm in diameter branches into two pipes of diameters 25 cm and 20 cm respectively as shown in Figure 2. If the average velocity in 50 cm diameter pipe is 4m/sec, find

i) Discharge through 50 cm diameter pipe

ii) Velocity in 20 cm diameter pipe, if the average velocity in 25 cm pipe is 3m/sec.
[BL: Apply| CO: 4|Marks: 7]

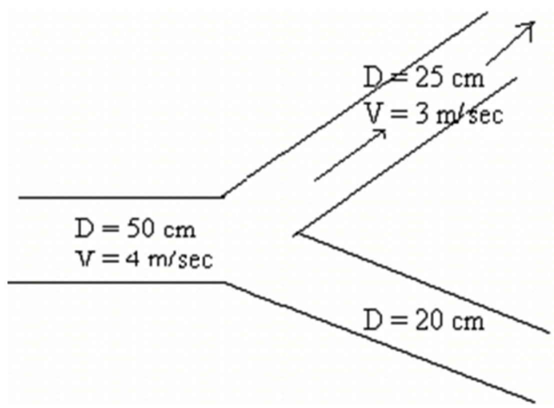

Figure 2

MODULE – IV

5. (a) Discuss about H.G.L and T.E.L and their relationship with the help of neat sketches for pipe flow. [BL: Understand| CO: 5|Marks: 7]

(b) In a 100mm diameter horizontal pipe a venturimeter of 0.5 contraction ratio has been fixed. The head of water on the venturimeter when there is no flow is 3 m (gauge). Find the rate of flow for which the throat pressure will be 2 m of water absolute. Take C_d is 0.97 and atmospheric pressure head is 10.3 m of water. [BL: Apply| CO: 5|Marks: 7]

6. (a) Write about Continuity and Bernoulli's equation. Discuss about various applications of Bernoulli's equation. [BL: Understand| CO: 5|Marks: 7]

(b) The horizontal 8 m long pipe is titled at an angle of 35^0. At the lower level, the section of the pipe is of 90 mm diameter and upper level of pipe with large section is of 250 mm diameter. If the pipe is equally tapering and the velocity of water at the lower (smaller) section is 1.5 m/s, calculate the difference of pressures between the upper and lower section.
[BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) List the types of head losses occurs in a pipe flow. Derive Darcy's Wiesbach equation for major losses in pipe. [BL: Understand| CO: 6|Marks: 7]

   (b) In a 1 in 40 model of spillway velocity and discharge are 2 m/s and 2.5 m^3/s respectively. Compute the corresponding velocity and discharge in prototype. [BL: Apply| CO: 6|Marks: 7]

8. (a) Classify various types pipe. Enumerate all the minor losses in the pipes with their formulas to estimate their magnitude. [BL: Understand| CO: 6|Marks: 7]

   (b) The main pipe divides into two parallel pipes which again forms one pipe. The data is as follows: For first parallel pipe, length is 1000m, diameter is 0.8 m and for second parallel pipe, length is 1000m, diameter is 0.6 m. Coefficient of friction for each parallel pipe of 0.005. If the total rate of flow in the main is $2m^3$/s find the rate of flow in each parallel pipe.

   [BL: Apply| CO: 6|Marks: 7]

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