

**B.TECH. SEM -IV (CIVIL) 2014 COURSE (CBCS) : SUMMER -
2018**

SUBJECT: MECHANICS OF FLUIDS

Day : **Thursday**
Date : **07/06/2018**

S-2018-2278

Time: **10.00 AM TO 01.00 PM**
Max. Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data if **NECESSARY**.

Q.1 a) What is Meta-center and Meta centric height? **(05)**

b) A triangular plate of 2 m base and 2.5 m height is immersed in water. The plane of plate is inclined 30° with free water surface. The base is parallel to and at depth of 2.5 m from water surface and apex is at the distance of 3.75 m from the water surface. Find the total pressure on the plate and position of center of pressure. **(05)**

OR

a) What is Newton's law of viscosity? **(05)**

b) A circular plate of 2.5 diameter is submerged in water. Its greatest and least depths are 2.5 and 1.5 m respectively below water surface. Determine. **(05)**
i) Total pressure on one face of plate ii) The position of center of pressure.

Q.2 a) What is steady and unsteady flow and explain with help of suitable examples. **(05)**

b) State whether following functions represent possible irrotational flow. **(05)**
i) $\psi = A(x^2 - y^2)$ ii) $\psi = xy$

OR

a) What is a velocity potential function and stream function? **(05)**

b) A pipe of 450 mm diameter branches into two pipes of 200 mm diameter and 250 mm diameter. If the average velocity in 450 mm diameter pipe is 1 m/s. find i) discharge through 450 mm diameter ii) Velocity in 200 mm diameter pipe if average velocity in 250 mm diameter pipe is 1.5 m/s. **(05)**

Q.3 a) What is Total Energy Line and Hydraulic Grade Line? **(05)**

b) A 5 m long pipe is inclined at 25° to horizontal. The smaller section of pipe which is at lower level is having 100 mm diameter and larger section of the pipe is 200 mm diameter. If the pipe is uniformly tapering and velocity of water at the smaller section is 1.5 m/s Determine the different of pressures between the two sections. **(05)**

OR

a) State and explain Bernoulli's theorem for real fluids. **(05)**

b) A smooth inclined pipe of uniform diameter 250 mm, a pressure of 40 Kpa was observed at section 1-1 which is at elevation of 10 m. At another section 2-2 at elevation of 12 m, the pressure is 15 kpa and velocity is 1.25 m/s. Determine the direction of flow and head loss between the two sections. Take water density = 998 kg/m^3 . **(05)**

Q.4 a) What is Geometric similarity and kinematic similarity? **(05)**

b) Using method of dimension analysis, obtain an expression for discharge Q over a rectangular weir. The discharge depends on the head H over the weir, acceleration due to gravity g, length of weir crest L, height of weir crest above the channel bottom Z and the kinematic Viscosity ν of liquid. **(05)**

P.T.O.

OR

- a) What are advantages and applications of model studies? (05)
- b) The resisting force F of a plane during flight can be considered as depending upon length of the air craft l , velocity V , air viscosity μ air density ρ , bulk modulus of air k . Express functional relationship between these variables and resisting force F using dimensional analysis. (05)

- Q.5** a) What is Displacement thickness and Momentum thickness? (05)
- b) The velocity distribution in the boundary layer, is given by $u/U=y/\delta$, where u is the velocity at a distance y from the plate. And $u =U$ at $y=\delta$, δ being boundary layer thickness. Determine (05)
- i) The energy thickness. ii) The value of δ^*/θ .

OR

- a) What are observations are made from Reynolds Experiment? (05)
- b) Draw and explain with the help of neat diagram, development of boundary layer over a flat plate. (05)

- Q.6** a) What is instantaneous velocity and temporal mean velocity? (05)
- b) Prove that the maximum efficiency is about 66% for hydraulic power transmission through a pipe. (05)

OR

- a) What are characteristics of Turbulent flow? (05)
- b) Explain sequence of events following sudden closure of a valve.(First two cycles only) (05)

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