

4E1209

Roll No. _____

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B. Tech. IV-Sem. (Back) Exam., Oct.-Nov. - 2020

Civil Engineering

4CE4 – 06 Hydraulic Engineering

Time: 2 Hours

Maximum Marks: 82

Min. Passing Marks: 29

Instructions to Candidates:

Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only)

[10×2=20]

All questions are compulsory

Q.1 Define cavitation.

Q.2 Define energy correction factor.

Q.3 What is a rain gauge?

Q.4 Define channel alignment.

Q.5 Determine the dimensions of kinematic viscosity.

Q.6 What is dynamic similarity?

Q.7 Define gradually varied flow.

Q.8 Define specific energy of flow.

Q.9 What is Weber's number?

Q.10 What is the working principle of a centrifugal pump?

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PART – B

(Analytical/Problem solving questions)

[4×8=32]

Attempt any four questions

- Q.1 Determine the distance from the centre of the pipe, at which the local velocity is equal to the average velocity for turbulent flow in pipes.
- Q.2 The resisting force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft l , velocity V , air viscosity μ , air density ρ & bulk modulus of air K . Express the functional relationship between these variables & resisting force by dimensional analysis.
- Q.3 Air is flowing over a smooth plate with a velocity of 10 m/sec. the length of the plate is 1.2m & width is 0.8m. If laminar boundary layer exists up to a value of $Re = 2 \times 10^5$, find the maximum distance from the leading edge upto which laminar boundary layer exists. Find the maximum thickness of laminar boundary layer, if the velocity profile is given by, $\frac{u}{U} = 2 \left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$. Take kinematic viscosity for air = 0.15 stokes.
- Q.4 A jet of water of diameter 50mm strikes a fixed plate in such a way that the angle between plate and jet is 30° . The force exerted in the direction of the jet is 1471.5 Newton. Determine the rate of flow of water.
- Q.5 Explain the term draft tube along with its principle.
- Q.6 Explain the term 'aquifer' along with its types.
- Q.7. Discuss all the cross-sectional parts of a channel along with a neat sketch.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [2×15=30]

Attempt any two questions

- Q.1 State Buckingham's π - theorem. What do you mean by repeating variables & how are these selected in dimensional analysis.
- Q.2 Prove that the loss of energy head in a hydraulic jump is equal to $\frac{(d_2 - d_1)^3}{4d_1d_2}$ where d_1 & d_2 are conjugate depths.
- Q.3 Derive the following conditions for most economical trapezoidal channel –
- (a) Half of top width is equal to one of the sloping sides of the channel.
 - (b) Hydraulic mean depth must be equal to half the depth of flow.
- Q.4 Explain Lacey's Regime theory, along with the important terms involved. Also discuss its drawbacks.
- Q.5 Explain the steps involved in converting a flood hydrograph to a unit hydrograph.
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