

Muzaffarpur Institute of Technology Muzaffarpur

B.Tech 4th Semester Mid-Term Examination, 2018

Hydraulics and Open Channel Flow

Time: 2 hours

Full Marks: 20

Instructions:

- (i) All questions carry equal marks.
- (ii) There are **Six** questions in this paper.
- (iii) Attempt **Four** questions in all.
- (iv) Question No. 1 is compulsory.

1. Chose the correct option of the following (any five)

(a) If the Reynold's number is more than 5×10^5 , the boundary layer is called

- (i) Laminar boundary layer
- (ii) Turbulent boundary layer
- (iii) Either of the above
- (iv) None of the above

(b) In the uniform flow in a channel of small bed slope, the hydraulic grade line

- (i) Coincides with the bed
- (ii) Is considerably below the free surface

(iii) Is considerably above the free surface

(iv) Coincides with the free surface

(c) If the bed particle size D_{50} of a natural stream is 2.0 mm, then by Strickler's formula, the manning's n for the channel is about

- (i) 0.013
- (ii) 0.017
- (iii) 0.023
- (iv) 0.044

(d) Which one of the following has dimensions:

- (i) Reynold's Number
- (ii) Froude Number
- (iii) Chezy's Constant
- (iv) None of these

(e) In uniform flow there is a balance between

- (i) Gravity and Inertial forces
- (ii) Gravity and Frictional forces
- (iii) Inertial and Viscous forces
- (iv) Inertial and Frictional forces

(f) At critical depth

- (i) The discharge is minimum for a given specific energy

- (ii) The discharge is minimum for a given specific force
 - (iii) The discharge is maximum for a given specific energy
 - (iv) The discharge is maximum for a given specific force
- (g) A triangular section is hydraulically-efficient when the vertex angle is
- (v) 30°
 - (vi) 60°
 - (vii) 90°
 - (viii) 120°
2. (a) Define Uniform flow. Write the features of Uniform flow.
- (b) Find the discharge in the following channels with a bed slope of 0.0006 and $n=0.016$:
- (i) Rectangular, $B = 2.0\text{m}$ and $y_0 = 1.20\text{m}$
 - (ii) Trapezoidal, $B = 2.0\text{m}$, $m = 1.5$ and $y_0 = 1.10\text{m}$
 - (iii) Triangular, $m = 1.5$ and $y_0 = 2.50\text{m}$,
3. (a) Define hydraulically efficient section. How efficient section is also economical?
- (b) It is required to convey 10 cumecs of water at a mean velocity of 1.25 m/s. Calculate the dimensions of the most efficient section of the channel whose shape is:
- (i) Rectangular
 - (ii) Trapezoidal
 - (iii) Triangular
4. Derive the expressions of geometric parameters for the most economical
- (a) Trapezoidal channel
 - (b) Rectangular channel sections, with the help of a neat sketch.
5. (a) Define Specific energy.
- (b) Calculate the critical depth and the corresponding specific energy for a discharge of $5.0 \text{ m}^3/\text{s}$ in the following channels:
- (i) Rectangular channel, $B = 2.0 \text{ m}$
 - (ii) Triangular channel, $m = 0.5$
6. The velocity distribution in the boundary layer is given by $u/U = (y/\delta)^{1/7}$. Calculate:
- (a) Displacement Thickness
 - (b) Momentum thickness