BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER: V**
BRANCH: CIVIL **SESSION : MO/2019**

SUBJECT : CE5003 FLUID MECHANICS II

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) Classify the following open channel flow situations: [2]
(i) Flow from a sluice gate, (ii) Flood in a river, (iii) Breaking of a dam, (iv) Flow over a spillway

(b) While measuring the discharge in a small stream it was found that the depth of flow increases at the ratio of 0.1 m/h. If the discharge at that section was 25 m^3/s and the surface width of the stream was 20 m, estimate the discharge at a section 1000 m upstream. [3]

Q2 (a) Explain the velocity distribution in open channels. [2]

(b) Derive the relations for kinetic energy and momentum correction factors. [3]

Q3 (a) Derive expression for average bed shear stress in an open channel. [2]

(b) Derive the formula for Chezy's equation and show the relationship between Chezy's coefficient and Darcy-Weisbach friction factor. [3]

Q4 (a) A trapezoidal channel is 10 m wide and has a side slope of 1.5 horizontal: 1 vertical. The bed slope is 0.0003. The channel is lined with smooth concrete of n = 0.012. Compute the mean velocity and discharge for a depth of flow of 3 m. [2]

(b) Determine the normal depth, bed width and sides slopes of a most efficient trapezoidal channel section to carry a discharge of 25 m^3/s. The longitudinal slope of the channel is to be 0.0009 and Manning's n can be taken as 0.015. [3]

Q5 (a) What is specific energy? Show the specific energy curves for different discharges. [2]

(b) Obtain expression of critical depth and specific energy at critical depth for:- [3]
(i) a rectangular channel, and (ii) a triangular channel.

Q6 (a) Water is flowing at critical depth at a section in a Δ shaped channel, with side slope of 0.5 H: 1 V. If the critical depth is 1.6 m, estimate the discharge in the channel and the specific energy at the critical depth section. [2]

(b) Calculate the bottom width of a channel required to carry a discharge of 15 m^3/s as a critical flow at a depth of 1.2 m, if the channel section is:- [3]
(i) rectangular, and (ii) trapezoidal with side slope 1.5 horizontal: 1 vertical.

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