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Total Number of Pages: 02

M.TECH
P2EVCC11

2nd Semester Regular Examination 2016-17

ENVIRONMENTAL HYDRAULICS

Branch: ENVIORN ENGG., ENVIRONMENTAL SCIENCE AND ENGG

Time: 3 Hours

Max Marks: 100

Q.CODE:Z965

**Answer Question No.1 which is compulsory and any FOUR from the rest.
The figures in the right hand margin indicate marks.**

- Q1 Answer the following questions: *Short answer type* (2 x 10)**
- a) What do you mean by time-independent flow?
 - b) Draw the plots of shear stress vs. velocity gradient for ideal fluid and Newtonian fluid.
 - c) Write down the Navier-Stoke's equation of motion, mentioning the each term.
 - d) What are the factors that influence the coefficient of discharge?
 - e) What is hydraulic gradient line?
 - f) Differentiate between prismatic and non-prismatic channels.
 - g) What do you mean by hydraulically efficient channel cross section ?
 - h) What is GVF ?
 - i) What is meant by "plug flow" ?
 - j) Explain NPSH for pumps.
- Q2 a) Derive the Euler's equation of motion. Then derive Bernoulli's equation. Also explain the meaning of each term. (10)**
- b) A venturimeter is to be fitted in a 150mm diameter pipe line horizontally at a section where the pressure is 100kN/m². if the maximum flow of water in the pipe is 150litres/sec, find the diameter of the throat so that the pressure at the throat does not fall below 75kN/m²(vacuum). Assume that 3% of the differential head is lost between the inlet and the throat. (10)**
- Q3 a) What are the different types of losses in pipe flow? Discuss all such losses. (10)**
- b) Three pipes -300m long, 300mm in dia.; 150m long 200mm dia.; 200m long 250mm dia.- are connected in series between two reservoirs. The friction factor values for the three pipes are 0.018, 0.020 and 0.0149 respectively. Determine the rate of flow if the difference in elevations of water levels between two reservoirs is 15m. Draw the HGL for the flow. Account for all losses and assume contractions and expansions are sudden. (10)**

- Q4 a)** A water distribution network is an equivalent triangle ABC in shape. If the inflow at the junction A is 60 units and the outflow at the junction B, C are 40 and 20 respectively, find the discharge in each pipe. Take the initial value of discharge from A to B is 15 units. Also take k – values as 4,1,2 for AB, BC,CA respectively. **(10)**
- b)** Explain how three reservoir problem can be solved . **(10)**
- Q5 a)** What do you mean by specific energy? Prove that Froude's Number is equal to one for critical flow. **(10)**
- b)** A hydraulically efficient trapezoidal channel has side slopes of 1:1. It is required to discharge $14\text{m}^3/\text{s}$ with a channel slope of 1 in 1000. If unlined, the value of Chezy's constant $C=45$. If lined with concrete, the value is 70. If the cost per m^3 of excavation is three times the cost per m^3 of lining, will the lined or unlined channel be cheaper? **(10)**
- Q6 a)** Derive the general equation for GVF. Also mention all the assumptions made in derivation. **(10)**
- b)** A stream has a width of 30m; depth of 3m and a mean velocity of 1.25m/sec. find the height of weir to be built on the stream floor to raise the water level by 1m. Assume the discharge coefficient as 0.95. **(10)**
- Q7 a) Write short notes on:** **(5x4)**
- (a) Hydraulic jumps
 - (b) Momentum equation
 - (c) Measurement of suction head
 - (d) Losses through valves.