M. Tech.-II (Civil-Hydraulic Engineering) (CBCS – 2015 Course) : SUMMER - 2019

SUBJECT: OPEN CHANNEL FLOW

Day: Saturday — Time: 11.00 AM TO 02.00 PM

Date: 08/06/2019 — **S-2019-3399** — Max. Marks: 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Answer to both the sections should be written in **SAME** Answer book.
4) Draw neat and labeled diagram **WHEREVER** necessary.
5) Assume suitable data, if necessary.

SECTION-I

Q.1 a) Differentiate between i) uniform and non-uniform flow ii) gradually varied flow and rapidly varied flow iii) subcritical and supercritical flow. **(06)**

b) What is momentum correction factor and derive its expression **(04)**

OR

a) Explain the basic difference between open channel flow and closed conduit flow. Explain with sketch **(5)**

b) Write short note on pressure variation in vertical **(5)**

Q.2 a) Derive Chezy's equation for uniform flow in an open channel. State the assumptions involved. **(5)**

b) Uniform flow occurs in a rectangular channel 3.0m wide at a depth of 2.0m. If Chezy's coefficient is 64 $m^{1/2}$/sec, determine the approximate height of roughness projections. Take g=10 m/sec^2. **(5)**

OR

a) What do you mean by tractive force in an open channel? Explain it with diagram. **(5)**

b) Explain i) Conveyance ii) Section factor iii) Normal depth. **(5)**

Q.3 a) Derive the condition for critical flow for any channel section and from that prove that the critical depth for a rectangular channel is $(q^2/g)^{1/3}$, where q is the discharge per meter width and g is gravitational acceleration. **(6)**

b) Define i)Specific energy ii) Specific force iii) Critical depth iv) Alternate depths. **(4)**

OR

a) Prove that for a given value of specific energy, discharge is maximum in a channel when the flow is critical. **(5)**

b) Show with usual notations specific energy $E = \dfrac{y_1^2 + y_1 y_2 + y_2^2}{(y_1 + y_2)}$ **(5)**

P.T.O.

SECTION-II

Q.4 a) Derive the expression for the gradually varied flow for a wide rectangular channel in the form , $\frac{dy}{dx} = So\frac{1-(y_n/y)^{10/3}}{1-(y_n/y)^3}$. **(6)**

b) List the gradually varied flow profiles which are possible. **(4)**

OR

a) Discuss the graphical method of GVF profile computation. **(5)**

b) Sketch and discuss the profiles on mild slope. Give examples. **(5)**

Q.5 a) Define hydraulic jump. What are uses of hydraulic jump? **(5)**

b) Find the relation between pre-jump and post-jump depth in case of hydraulic jump. **(5)**

OR

a) Define hydraulic jump. State assumptions in the theory of hydraulic jump. **(5)**

b) For a hydraulic jump in a rectangular channel prove with usual notations **(5)**

$$\sqrt{1+8F_{r1}^2}-1=\frac{4}{\sqrt{1+8F_{r2}^2-1}}$$

Q.6 Write St. Venant's equations. What are the assumption made in the derivation of these equations. **(5)**

OR

Explain the terms i)Celerity ii) surges iii) Positive surge iv) Negative surge in case of open channel flow. **(5)**

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