

B.Tech. SEM -V (Civil) 2014 Course (CBCS) : WINTER - 2018
SUBJECT : ADVANCED MECHANICS OF FLUID

Day Saturday
Date 01/12/2018

W-2018-2388

Time 02.30 PM TO 05.30 PM
Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data if necessary.

Q.1 a) Find bed slope of a rectangular channel of width 4 m when depth of flow is 2.5 m and water flows at rate of 20 m³/ sec. Take Chezy's constant C = 50. **(05)**

b) What is specific force diagram? **(05)**

OR

a) Explain velocity distribution in an open channel flow. **(05)**

b) Find rate of flow and conveyance of rectangular channel of 6 m wide. Depth of flow of water in the channel is 2.0 m. The channel is having bed slope of 1 in 2000. Take Chezy's constant C = 60. **(05)**

Q.2 a) Derive $\frac{dy}{dx} = \frac{S_0 - S_f}{1 - F_r^2}$ in case of gradually varied flow. **(05)**

b) Write steps for direct step method to compute GVF profile. **(05)**

OR

a) Explain classification of surface profiles. **(05)**

b) Draw a neat sketch of profiles on mild slope. **(05)**

Q.3 a) What are types of hydraulic jump based on Froude Number? **(05)**

b) Derive the equation $y_1 = \frac{y_2}{2} \left[-1 + \sqrt{1 + 8 F_{r2}^2} \right]$ **(05)**

OR

a) What are the assumptions in the theory of hydraulic jump? **(05)**

b) In a rectangular channel of 0.5 m wide, a hydraulic jump occurs at a depth of 0.1 m and Froude Number 2.7. Determine i) The specific energy ii) The critical and subsequent depths iii) Loss of head. **(05)**

Q.4 a) What are the assumptions made in rigid water column theory? **(05)**

b) What is water hammer phenomenon? **(05)**

P.T.O.

OR

- a) Derive equation for unsteady flow. (05)
- b) What is celerity of pressure waves? (05)
- Q.5** a) What are types of drag? (05)
- b) A 25 mm diameter cable stretches between two towers 300 m apart. Find the force exerted by the wind at 45 Kmph transverse to cable. Air weights 12 N/m^3 $C_d = 1.2$. (05)

OR

- a) What is i) Skin friction drag ii) Pressure drag. (05)
- b) A flat plate 1 m x 1 m moves at 5 Kmph transverse to its plane. Find resistance to motion of plate. i) When plate moves through air. ii) When plate moves through water $C_d = 1.1$ $\rho_{\text{air}} = 1.2 \text{ kg/m}^3$ $\rho_{\text{water}} = 1000 \text{ kg/m}^3$. (05)
- Q.6** a) What is suction head, delivery head, static head and manometric head in case of centrifugal pump? (05)
- b) Design a Pelton wheel with following data. Number of jets = 2, Head = 350 m, Power = 10,000 kw; Speed = 500 rpm, overall efficiency = 90% $C_v = 0.98$, Speed ratio = 0.45. (05)

OR

- a) What is gross head and net head in case of turbines? (05)
- b) Show that maximum efficiency of an undershot wheel is 50%. (05)

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