B.TECH. SEM -V (CIVIL) 2014 COURSE (CBCS) : WINTER - 2017

SUBJECT : ADVANCED MECHANICS OF FLUID

Day **Saturday** Time **02.30 PM TO 05.30 PM**

Date **20/01/2018** Max. Marks : 60

W-2017-2125

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Draw neat and labeled diagram **WHEREVER** necessary.
5) Assume suitable data if necessary.

Q.1 **a)** What is hydraulically most efficient channel section for rectangular channel? **[05]**

b) Find bed slope of a trapezoidal channel section of bed with 5m, depth of water is 1.5m and side slopes are 3H:4V. The discharge through channel is $25m^3/sec$. Take C = 70. **[05]**

OR

a) What is hydraulic depth and section factor? **[05]**

b) Determine the most economical section of rectangular channel carrying water at rate of $0.75m^3/sec$. The bed slope of channel being 1 in 2500. Take Chezy's constant C = 55. **[05]**

Q.2 **a)** Draw a neat diagram showing mild slope profiles. **[05]**

b) Explain classification of surface profiles. **[05]**

OR

a) Derive differential equation of gradually varied flow. **[05]**

b) Write steps for direct step method. **[05]**

Q.3 **a)** Write the procedure for location of hydraulic jump. **[05]**

b) What are the practical applications of hydraulic jump? **[05]**

OR

a) Write assumptions made in the theory of hydraulic jump. **[05]**

b) A hydraulic jump is formed when water flows through a rectangular channel of 0.6m wide and 0.18m deep at Fraude No. 2.7. Find the specific energy head, the critical depth, sequent depth and head lost in hydraulic jump. **[05]**

Q.4 **a)** Derive expression for celerity of waves. **[05]**

b) Write the assumptions made in rigid water column theory. **[05]**

P.T.O.

OR

a) What are surge tanks? Explain its functions. **[05]**

b) What is water hammer phenomenon? **[05]**

Q.5 **a)** What are types of drag? **[05]**

b) A flat plate of size 1m × 1m moves at 2m/s normal to its plane. Find resistance to motion of plate: **[05]**
i) When the plate moves through air.
ii) When plate moves through water.
$C_d = 1.1$ $\rho_{air} = 1.2$ kg/m^3 $\rho_{water} = 999$ kg/m^3.

OR

a) What is pressure drag and skin friction drag? **[05]**

b) A flat plate of 0.5m × 0.5m was kept in a wind tunnel with a wind speed of 25kmph. The plate is kept in such a way that $C_d = 0.18$ and $C_L = 0.8$ respectively. Determine: **i)** Drag force **ii)** Lift force. **[05]**

Q.6 **a)** Show that for curved moving plate with jet striking at the center, the maximum efficiency is just 60%. **[05]**

b) A jet of water of 8cm diameter having velocity 10m/s strikes normally a smooth flat plate. Determine the thrust when: **[05]**
i) The plate is stationary.
ii) The plate is moving with velocity 2m/s in the direction of jet.

OR

a) What is static head and manometric head in case of centrifugal pump? **[05]**

b) Design a Pelton wheel with following data: **[05]**
No. of jets = 2, Head = 350m, Power = 12000kw, speed = 700rpm, overall efficiency = 98%, $C_V = 0.99$ speed ratio = 0.45.

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