BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - V : : SUMMER - 2022
SUBJECT : ADVANCED MECHANICS OF FLUID

Day : Monday

Date : 30-05-2022

S-13608-2022

Time : 10:00 AM-01:00 PM

Max. Marks : 60

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 trapezoidal section? **[05]**

b) Find bed slope of a rectangular channel of width 4m and depth 2m. The rate of flow is given as $25m^3/s$. C = 55. **[05]**

OR

a) What are the factors affecting Manning's roughness constant? **[05]**

b) Find the bed slope of trapezoidal channel section of bed width 5m, depth of water is 2.0m and side slopes are 3H:4V. The discharge through channel is $20m^3/s$. Take C = 65. **[05]**

Q.2 **a)** Differentiate between Gradually Varied Flow and Rapidly Varied Flow. **[05]**

b) Draw a neat diagram and explain flow profiles on steep slope. **[05]**

OR

a) Write basic assumptions made in derivation of Gradually Varied Flow. **[05]**

b) Draw a neat diagram and explain flow profiles on mild slope. **[05]**

Q.3 **a)** What are the assumptions made in the theory of hydraulic jump? **[05]**

b) A sluice gate discharges water into horizontal rectangular channel with a velocity of 8m/s and depth of flow is 1m. Determine depth of flow of water after the jump and consequent loss in total head. **[05]**

OR

a) What are practical applications of Hydraulic Jump? **[05]**

b) In a rectangular channel of 0.7m wide, a hydraulic jump occurs at a point where depth of flow of water is 0.10m and Fraude Number is 2.5. Determine : **[05]**
   i) The specific energy.
   ii) The critical and subsequent depths.
   iii) Loss of head.
   iv) Energy dissipated.

Q.4 a) Derive equation of motion for unsteady flow. **[05]**

b) What is a surge tank? What are its functions? **[05]**

OR

a) What is Water Hammer Phenomenon? **[05]**

b) What an assumptions made in rigid water column theory? **[05]**

Q.5 a) What is profile drag and deformation drag? **[05]**

b) A 15mm diameter cable is stretched between two buildings 700m apart. Find **[05]** the force exerted by wind at 25kmph transverse to the cable. Air weights $12N/m^3$. $C_d = 0.15$.

OR

a) What are drag and lift forces? **[05]**

b) Air flow across a cylinder of 50mm diameter and 1.5m in length. The air **[05]** velocity is 0.2m/s. Find total drag, shear drag, pressure drag on the cylinder if total drag and shear drag coefficients are 1.2 and 0.25 respectively.
Air density $= 1.2 \text{ kg/m}^3$.

Q.6 a) What is governing of turbine? **[05]**

b) A jet of water of diameter 40mm moving with a velocity of 25m/s strikes a **[05]** fixed plate. The angle between the plate and jet direction is 55^0. Find force exerted by jet on the plate in the direction normal to the plate.

OR

a) What is volumetric efficiency and overall efficiency of a centrifugal pump? **[05]**

b) Find diameter of wheel and diameter of jet and no. of jets required for Pelton **[05]** wheel with following data:
Jet ratio = 12, power output = 4000kw, $C_v = 0.98$, speed ratio = 0.46, overall efficiency = 98%, Head = 300m and N = 700.

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