C.U.SHAH UNIVERSITY
Summer Examination-2019

Subject Name: Fluid Mechanics - II

Subject Code: 4TE04FLM1   **Branch: B.Tech (Civil)**

Semester: 4   Date : 18/04/2019   Time : 02:30 To 05:30   Marks : 70

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1   **Attempt the following questions:**   **(14)**

a)   Write the Bernoulli's equation for steady flow.

b)   Define Pump.

c)   Centrifugal pump works on _____ force

d)   What is the unit of specific energy?

e)   Enlist the fundamental dimension.

f)   A line along which the velocity potential is constant is called----------
       a) stream line   b) Path line   c) Equi-potential line   d) streak line

g)   Define the term model.

h)   What is meant by ideal fluid?

i)   Write the Manning's formula for velocity of flow.

j)   Enumerate the types of hydraulic jump.

k)   Write the difference between super critical flow and subcritical flow.

l)   If the Reynolds number value lies between 2000 to 4000 is called --------- flow

m)   Write the relationship between critical depth and minimum specific energy.

n)   Abbreviate the term 'GVF 'and RVF'.

Attempt any four questions from Q-2 to Q-8

Q-2   **Attempt all questions**   **(14)**

(a) A fluid flow field is given by $\vec{V} = (x^3 y)\,\vec{i} - (2yz^2 - 4t)\,\vec{j} + (y^3 z)\vec{k}$. Calculate the velocity and acceleration at the point (2, 1, 1) after 2 sec (t =2). **08**

(b) Derive the Bernoulli's equation from Euler's equation of motion. **06**

Q-3 **Attempt all questions** **(14)**

(a) Explain the occurrence and shape of different surface water profiles **07**

(b) Water flows through a pipe AB of diameter 60 mm which is in series with a pipe BC of diameter 75 mm in which the velocity is 2.6 m/s. At C, the pipe branches. The velocity in CD is 1.58 m/s and the other branch CE is of diameter 30 mm and the conditions are such that the discharge in pipe CD is equal to two times the discharge in CE. Calculate the discharge in AB and CD, the velocity in the pipe AB and CE and the diameter of CD. **07**

Q-4 **Attempt all questions** **(14)**

(a) Find out bed slope of trapezoidal channel of bed width 4 m, depth of water 3m and side slope of 1 horizontal to 2 vertical. When discharge through channel is 35 m^3 /sec. Take Manning's Constant N = 0.03. **07**

(b) A rectangular channel carries a discharge of 20 cumecs with pre-jump depth of 1m. The width of channel is 6m. If the hydraulic jump forms on downstream side calculate the post-jump depth and energy loss. **07**

Q-5 **Attempt all questions** **(14)**

(a) In a two dimensional flow through a channel, the fluid velocity components are given by u = 2xy + 4x, v = x -4xy. Determine the velocity potential function and stream function **08**

(b) What is meant by flow net? Explain it is practical application in Civil Engineering field. **06**

Q-6 **Attempt all questions** **(14)**

(a) What are the types of similitude? Explain any two of them. **07**

(b) Enlist the forces acting on Fluid in motion. **04**

(c) What is meant by 'Afflux'? **03**

Q-7 **Attempt all questions** **(14)**

(a) Find the expression for the power P, developed by a pump when P depends upon the head H, the discharge Q, and specific weight ω, of the fluid. **07**

(b) Calculate the critical depth and critical velocity of water flowing in a rectangular channel of width 4 m carrying a discharge of 15 m^3/s. Also calculate minimum specific energy. **07**

Q-8 **Attempt all questions** **(14)**

(a)   Enumerate the classification of turbine.   **04**

(b)   Explain in detail the working principle of reciprocating pump with neat sketch.   **07**

(c)   Differentiate a prototype and its model.   **03**