C.U.SHAH UNIVERSITY
Winter Examination-2019

Subject Name: Fluid Mechanics - II
Subject Code: 4TE04FLM1   **Branch: B.Tech (Civil)**
Semester: 4   **Date: 13/09/2019**   **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)   Define the term 'Prototype'.

   b)   Enlist the types of pump.

   c)   Write the relationship between specific energy and minimum specific energy.

   d)   Define: Uniform flow

   e)   Enlist the fundamental dimension.

   f)   Define path line.
   g)   State Newton's law of viscosity.

   h)   Give example for real 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 below 2000 is called --------- flow

   m)   Define 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)   Explain the occurrence and shape of different surface water profiles   **08**

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

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

(a)	Derive expressions for Euler's equation of motion		**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 fluid flow field is given by $\vec{V} = x^2\vec{i} + 2yz\,\vec{j} + (yz^2+2t)\vec{k}$. Calculate the velocity and acceleration at the point (1, 2, 1) after 2 sec (t =2).   **07**

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

(a) Write the relationship between stream function and potential function.   **06**

(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.   **08**

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

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

(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.   **08**

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

(a) The resistance R, to the motion of a completely submerged body depends upon the length of the body L, velocity of flow V, mass density of fluid ρ and kinematic viscosity of fluid η. By dimensional analysis prove that $R = \rho V^2 L^2 \phi(\frac{VL}{\eta})$ **07**

(b) How will you select repeating variables in the application of Buckingham's π theorem?   **07**

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

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

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

(c) Determine the dimensions of dynamic viscosity.   **03**