

C.U.SHAH UNIVERSITY

Summer Examination-2022

Subject Name: Fluid Mechanics-II

Subject Code: 4TE04FLM1

Branch: B.Tech (Civil)

Semester: 4

Date: 09/05/2022

Time: 11:00 To 02:00

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.
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- Q-1 Attempt the following questions (14)**
- a) Which is the cheapest device for measuring flow / discharge rate? (1)
a) Venturimeter b) Pitot tube c) Orificemeter d) None of the mentioned
 - b) Calculate the critical depth of a rectangular channel having width 3m and the discharge through it is 15 m³/s. (1)
a) 0.36m b) 1.36m c) 2.36m d) 3.36m
 - c) Which among the following is an assumption of Hagen-Poiseuille equation? (1)
a) Fluid is compressible b) Fluid is uniform c) Fluid is laminar d) Fluid is turbulent
 - d) Which among the following does not depend on the friction factor? (1)
a) Pipe diameter b) Fluid density c) Viscosity d) Weight
 - e) If a liquid enters a pipe of diameter d with a velocity v, what will it's velocity at the exit if the diameter reduces to 0.5d? (1)
a) v b) 0.5v c) 2v d) 4v
 - f) What is a prototype? (1)
a) A small-scale replica b) Actual structure c) Theory structure d) Adopted structure
 - g) The characteristic curves of a centrifugal pump, plots _____ required by the pump. (1)
a) Velocity b) Pressure c) NPSH d) Velocity and pressure
 - h) The Prandtl Number approximates _____ (1)
a) Momentum diffusivity to thermal diffusivity
b) Thermal diffusivity to momentum diffusivity
c) Shear stress to thermal diffusivity
d) Thermal diffusivity to kinematic viscosity
 - i) Which among the following is the standard symbol for Froude number? (1)
a) F b) Fo c) Fr d) f
 - j) Coefficient of friction of a laminar flow is _____ (1)
a) Re/16 b) Re/64 c) 16/Re d) 64/Re
 - k) Hydraulic energy is converted into another form of energy by hydraulic machines. (1)
What form of energy is that?
a) Mechanical Energy b) Electrical Energy c) Nuclear Energy d) Elastic Energy
 - l) What is energy per unit head of water called as _____ (1)
a) Total energy b) Specific energy c) Velocity head d) Datum head
 - m) Which of the following is not a case of ideal fluid flow? (1)



- a) Forced vortex Flow b) Uniform Flow c) Sink Flow d) Superimposed flow
- n) When is orifice called 'large orifice'? (1)
- a) If the head of liquid is less than 5 times the depth of orifice
- b) If the head of liquid is less than 2.5 times the depth of orifice
- c) If the head of liquid is less Hence, 4 times the depth of orifice
- d) If the head of liquid is less than 1.5 times the depth of orifice

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

- Q-2 Attempt all questions (14)**
- A) Explain Buckingham's method of dimensional analysis (7)
- B) Derive the Continuity equation for 2D and 3D flow (7)
- Q-3 Attempt all questions (14)**
- A) A fluid flow field is given by $\vec{v} = (x^2y)\vec{i} + (2yz - 4t)\vec{j} + (yz^2)\vec{k}$. Calculate the velocity and acceleration at the point (1, 2, 1) after 2 sec (t=2). (7)
- B) A trapezoidal channel is 9.0 m wide and has a side slope of 1.5 horizontal: 1 vertical. The bed slope is 0.0004. The channel is lined with smooth concrete of n = 0.02. Compute the mean velocity and discharge for a depth of flow of 1.8 m (7)
- Q-4 Attempt all questions (14)**
- A) Give practical example of (i) critical flow (ii) sub-critical flow (iii) super-critical flow. (7)
- B) Explain Circulation and Vorticity (7)
- Q-5 Attempt all questions (14)**
- A) Draw the hydraulic grade line and total energy line for gradually varied flow in open channel. (7)
- B) Explain the characteristics of turbulent flow. (7)
- Q-6 Attempt all questions (14)**
- A) Explain the terms of Bernoulli's equation also its limitation. (7)
- B) Find out bed slope of trapezoidal channel of bed width 4 m, depth of water 3m and side slope of 2 horizontal to 3 vertical. When discharge through channel is 20 m³/sec. Take Manning's Constant N = 0.03. (7)
- Q-7 Attempt all questions (14)**
- A) Derivation: Vortex flow and stream function for it (7)
- B) Explain the uses of flow net. (7)
- Q-8 Attempt all questions (14)**
- A) Explain the requirement of dimensional analysis and model testing. (7)
- B) Explain the types of hydraulic jump. (7)

