Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2017

SUBJECT: **FLUID MECHANICS [CIE – 2101]**

REVISED CREDIT SYSTEM

(/ /2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data, if any, may be suitably assumed.

1A.	Define the terms (i) capillarity (ii) surface tension (iii) cohesion (iv) adhesion.	**02**
1B.	Show that the pressure at any point in a static mass of liquid depends only upon the vertical depth of the point below the free surface and the specific weight of the liquid.	**04**
1C.	The length of a tainter gate (**Fig. Q1C**) is 1m perpendicular to the plane of the paper. Find out the horizontal force and the total hydrostatic force on the gate.	**04**
2A.	(i) State Bernoulli's theorem; (ii) Obtain the same from fundamentals by deriving the Euler's equation; (iii) State clearly the assumptions made in the derivation.	**04**
2B.	Water flows up a vertical pipe of diameter 180 mm contracting to a diameter of 120 mm in a height of 0.25 m. If the rate of flow is 80 lps, find the pressure fall across the contraction. Take loss of head equal to 0.27 times the kinetic head in the region of smaller diameter of the pipe.	**02**
2C.	In a two dimensional incompressible flow, the fluid velocity components are given by u = x – 4y and y = – y– 4x. Show that the velocity potential exists and determine its form. Find also the stream function.	**04**
3A.	Derive the expression for the loss of head due to sudden expansion in a horizontal circular pipe.	**04**

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3B.	A pipe line 2.5 km long and 180 mm diameter conveys a discharge of 0.015 m^3/sec from a high level tank to a low level tank. It is planned to increase the discharge to the lower tank by 30% by attaching an additional pipe in parallel for the latter half of the length of the pipe. Find the diameter of this pipe Take f as 0.03 and neglect minor losses.	**03**
3C.	Oil of density 900 kg/m3 and dynamic viscosity 0.18 N-s/m2 flows through an inclined pipe of diameter 60 mm. The pipe is inclined at 35° to the horizontal. At sections A and B which are 10 m apart the pressure intensities are 360 kPa and 275 kPa respectively. Assuming steady laminar flow find: (i)The direction of flow; (ii) Rate of flow; (iii) Justify that the results are consistent with laminar flow.	**03**
4A.	(i) Distinguish between critical, supercritical and subcritical flows in open channels. (ii) Obtain the expression for minimum specific energy and maximum flow when Froude's number is unity in an open channel flow.	**03**
4B.	A trapezoidal section of best hydraulic properties carries a discharge of 15 cumec at a velocity of 1m/s. The sides slope is 2H:1V. Determine the bed width, depth of flow and the longitudinal slope required for the above condition, Take Manning's n =0.02.	**04**
4C.	A rectangular channel 6m wide carries 10cumec of water at a depth of 1.5m. Find: (i) Specific energy required to carry the flow; (ii) the minimum specific energy required to carry the flow and the corresponding depth, velocity; (iii) the depth alternate to1.5m to carry the flow with same specific energy.	**03**
5A.	(i) Define the terms: Orifice, Mouthpiece; State with reason advantage of Mouthpiece. (ii) Define the term Cippoletti Notch; State its advantage giving reason.	**1+1**
5B.	The flow in a rectangular channel of flow area 0.27 m^2 is measured using a 40 cm long **suppressed** rectangular notch. If the depth of water on its U/S is 22.5 cm above the sill, find the discharge. If the same discharge is to be measured with a 90^0 V-notch, find its required depth and top width. Take C_d = 0.62 and consider velocity of approach for both the notches.	**04**
5C.	A 3m × 4m tank has a 15 cm diameter opening (C_d = 0.6) provided at its bottom, A constant discharge of 90 lps is supplied into the tank with its orifice open. Find: (i) the time required to reduce the depth of water in the tank from 5 m to 2 m; (ii) Volume of water flowing out of the tank in that time.	**04**

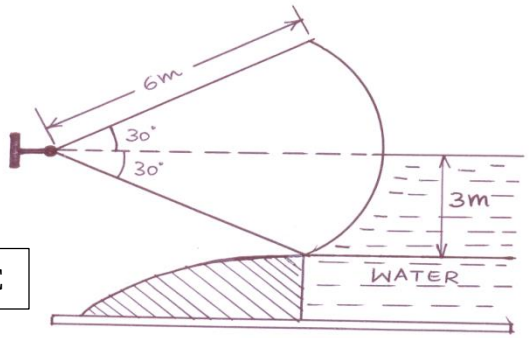

Fig. Q1C

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