Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

III SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: FLUID MECHANICS [CIE- 2101]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	Define the terms: (i) Absolute Zero pressure; (ii) Zero Gauge pressure; (iii) Vacuum pressure; (iv) Pressure head.	**(2)**
1B.	Derive the expression 'for Capillary rise of a liquid with a neat sketch showing all the terms involved in the expression.	**(4)**
1C.	Figure Q.I C shows the water levels on the two sides of a 100 N cylinder placed on the floor of a water channel. If the diameter of the cylinder is 2m, its length is 1.5m, determine the magnitude and inclination of Resultant Hydrostatic force on the cylinder. Show that the Resultant Hydrostatic force passes through the center of cylinder and that it does not get lifted-up.	**(4)**
2A.	State the expressions for rotational and acceleration components for 3D steady flow.	**(2)**
2B.	A conical tube is fixed vertically with its larger diameter at the top and it forms a part of the pipe line carrying kerosene (Sp. Gr. 0.80). The velocity at the smaller end is 3.0 *m/s*, and at the larger end is 1.5 *m/s*. The tube is 2.0 m long. At the bottom of the tube the pressure is 50 kPa. The head loss in the tube is assumed to be 0.35 times the difference in the velocity heads at its two ends. Estimate the pressure at the top of the tube when the flow is upwards. How will the pressure change if the flow is downwards?	**(4)**
2C.	A 30 cm x 15 cm venturimeter is provided in a vertical pipe line carrying oil of specific gravity 0.9, the flow being upwards. The difference in elevation of the throat section and entrance section of the venturimeter is 30 cm. The differential U-tube mercury manometer shows a gauge deflection of 25 cm. Calculate: (i) The discharge of oil; (ii) The pressure difference between the entrance section and the throat section. Take C_d as 0.98 and specific gravity of mercury as 13.6.	**(4)**
3A.	State the expression for the Minor head losses in a pipe-flow indicating clearly what each symbol represents.	**(2)**
3B.	A pumping plant supplies water through a 60 cm diameter main, the frictional head loss being 27 m. In order to reduce the power consumption, it is proposed to lay another main of appropriate diameter along the side of existing one, so that the two pipes may work in parallel for the entire length and reduce the frictional head loss to 9.6 m only. Find the diameter of the new main, if with the exception of the diameter, it is similar to the existing one in every repect.	**(4)**

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3C.	Crude oil of viscosity 1.5 poise and relative density 0.9 flows through a 20 mm diameter vertical pipe. The pressure gauges fixed at A reads 6x 10^5 N/m^2 and that at Breads 2x10^5 N/m^2, B being 20 m above A. Find the direction and rate of flow in the pipe assuming the flow to be laminar. Check if the assumption is correct.	**(4)**
4A.	(i) Give the expression for Froude's Number and explain its significance. (ii) Define the term Hydraulic Jump and give examples of places of its occurrence.	**(1+1)**
4B.	Derive the condition for critical depth of flow in terms of discharge and prove that minimum is to 1.5 times critical in a channel.	**(4)**
4C.	Determine most efficient dimensions for trapezoidal channel (side slopes IV: 2H) carrying a discharge of 12.5 m^3/s, with a velocity of 0.85 *m/s*. Also, determine the bed slope of the channel, shear stress at channel bed, Reynold's number and comment on the type of flow. Take n = 0.025; viscosity coefficient 0.00981 Ns/m^2	**(4)**
5A.	(i) Define: Orifice and Mouthpiece; State with reason advantage of Mouthpiece. (ii) Define the terms Free Nappe and Ventilation ; State the necessity of Ventilation .	**(1+1)**
5B.	A broad crested weir (Cd = 0.6) 50m in length is installed in a rectangular channel of *C/S* area 50m^2, If the depth of water on its U/S is 50cm above weir crest, find discharge over weir considering velocity approach.	**(4)**
5C.	A 10m x 6m swimming pool with horizontal bottom has water to a depth of 1.5m. If the water is discharged through a 0.25 m^2 opening (C_d = 0.62) provided at its bottom, find: (i) the time required to reduce the depth to half its initial depth; (ii) the time required to completely empty pool.	**(4)**

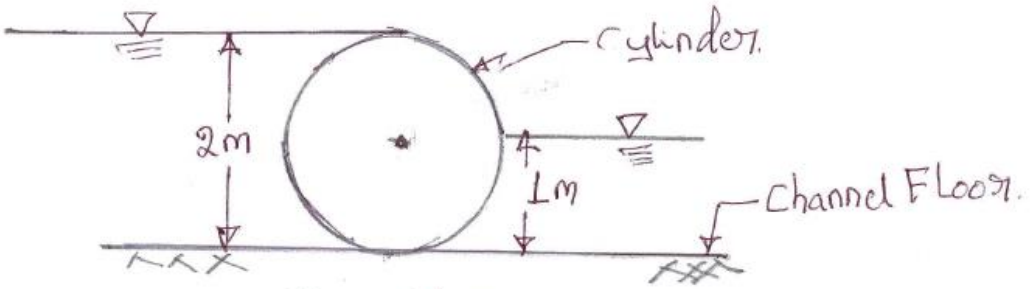

Fig. Q1.C.