Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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A Constituent Institution of Manipal University

III SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, DEC/JAN 2016-17

SUBJECT: FLUID MECHANICS [CIE - 2101]

REVISED CREDIT SYSTEM

(/ / 2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Draw a neat diagram if necessary

1A.	Define the terms: (i) Pressure head (ii) Simple Manometer; (iii) Differential Manometer; (iv) Compound Manometer.	**02**
1B.	Derive the expression for Pressure Difference between inside & outside of, Liquid Jets; (ii) Liquid Bubbles.	**04**
1C.	A rectangular plate 2m x 1.5m, with a concentric circular hole of 0.5m radius, is immersed in a liquid (density 800 kg/m^3) with its surface making an angle of 30° with horizontal and the shorter side parallel to the free surface of the liquid. The edge nearer to the free surface of the liquid is at a depth of 1.5m below the free surface of the liquid. Find the Total pressure and its location.	**04**
2A.	Derive from first principle Euler's equation of motion along a stream line and obtain Bernoulli's theorem from the same. Mention clearly the assumptions made.	**04**
2B.	Water flows down a 45m long inclined tapering pipe laid at a slope of l in l0. At its upper end C/S area is 8 m^2, pressure is 98.1 kPa; at its lower end C/S area is 3 m^2, velocity is 4.5 *m/s.* If the head loss is assumed to be 0.35 times the difference in the velocity heads at the two ends, find the discharge through the pipe and pressure at lower end. If the same discharge flows up the pipe with same pressure at its upper end and same loss of head, what will be the pressure at lower end?	**03**
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	**03**
3A.	Define the terms: (i) Pipe flow; (ii) Laminar flow; (iii) Turbulent flow; (iv) Transitional flow	**02**
3B.	A main pipe divides into two parallel pipes. The length and diameter of the first parallel pipe are 2000 m and 1.0 m respectively, while the length and diameter of the second parallel pipe are 2000 m and 0.8 m. Find the rate of flow in each parallel pipe if the total flow in the main pipe is 3.0 $m^3/sec.$ The coefficient of friction for each parallel pipes is same and equal to 0.02.	**04**

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3C.	A liquid (S = 0.9) of viscosity 9.74 poise is flowing through a l0 m long horizontal pipe 100 mm in diameter at the rate of 70 lps. (i) Find the Power required to maintain the flow and sketch the distribution of velocity across the depth of the pipe giving value of maximum velocity and velocity values at 25 mm from pipe wall. Assume flow to be Laminar. (ii) Check whether the assumption is correct.	**04**
4A.	List the assumptions made in the analysis of hydraulic jump and derive an expression for energy loss (ΔE) due to a hydraulic jump.	**04**
4B.	A rectangular channel of bottom width 6m conveys a discharge of $10m^3$/sec. Compute the critical depth, critical specific energy and also critical bed slope of the channel if Manning's n=0.025.	**03**
4C.	A channel of trapezoidal section, having side slope 2H: 1V is to carry a flow of 20 m^3/sec on a longitudinal slope of 1 in 3000. Take Manning's n equal to 0.02. Find the dimensions of the most economical section of the channel.	**03**
5A.	Define: End contraction, Suppressed weir, Contracted weir, Narrow crested weir	**02**
5B.	A Trapezoidal notch (C_d = 0.6) is 1.2m wide at the top, 0.5m wide at bottom and 0.4*m* in its height. If the head of water over its sill is 0.3 m find the discharge through the notch.	**04**
5C.	Head of water over a mouthpiece (Φ = 75 mm, length = 250mm) is 1.8m. Find the actual discharge, actual velocity and actual C/S area of jet at outlet of the mouthpiece. Take Cv = 0.98.	**04**

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