Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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(A constituent unit of MAHE, Manipal)

IIISEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2018

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

REVISED CREDIT SYSTEM

(20 /11 /2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	Determine the pressure difference between point A and point B in **Fig.QlA.** Relative density of benzene and kerosene are 0.876 and 0.80 respectively.	**03**	**CO2**
1B.	A shaft of 20mm diameter and mass l5kg slides vertically in a hollow cylinder with a velocity of 5 *mls*. The gap between the shaft and the cylinder is 0.1lmm and is filled with oil. Calculate the viscosity of oil if the length of the shaft is 500mm.	**03**	**C01**
1C.	Fig. QIC shows the water levels on the two sides of a cylinder weighing 100N 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 the resultant hydrostatic force on the cylinder. Show that the resultant hydrostatic force passes through the center of the cylinder.	**04**	**CO2**
2A.	(i)State Bernoulli's theorem; (ii) Obtain the same from fundamentals by deriving the Euler's equation; (ii) State clearly the assumptions made in the derivation.	**04**	**CO3**
2B.	A 6m long pipe is inclined at an angle of 20° with the horizontal. The smaller section of the pipe which is at the lower level is 100mm diameter and the larger section of the pipe which is above the ground is 300mm diameter. If the pipe is uniformly tapering and the velocity of water at the smaller section is 1.8m/s, determine the difference of pressure difference of pressure between the two sections. **(Refer Fig. Q2B).**	**02**	**CO4**
2C	The stream function for a two dimensional flow is given by $\psi = -xy - 2x^2 + 2y^2$. Show that the velocity potential exists and determine its form. Find also the resultant velocity at the point P (4,2)	**04**	**CO3**
3A.	Define: a) Stream line b) Streak line c) Stream Function d)Velocity Potential Function	**04**	**C03**
3B.	A 250mm diameter, 3 km long straight pipe runs between two reservoirs of surface elevations 135m and 60m. Another pipe of 300mm diameter is laid parallel to this pipe from its mid-point to lower reservoir. Find the percentage increase in the charge by neglecting minor losses. Take friction factor = 0.02 for both the pipes.	**04**	**C04**
3C.	Two reservoirs having a difference of elevation of 15m are connected by a 200mm diameter syphon. The length of the syphon is 400m. The summit is 3m above the water level in the upper reservoir. The length of the pipe from the upper reservoir to the summit is 120m. Determine	**04**	**C04**

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	i) Discharge through the syphon ii) Pressure at the summit. Take coefficient of friction = 0.005 and neglect minor losses		
4A.	Water flows in a wide channel at q=10m2/s/m length. The flow undergoes a hydraulic jump, with depth of flow before the jump equal to 1.25m. Find, (i). The depth of flow after the jump (ii).Velocity before and after the jump (iii). Froude's number before and after the jump (iv). The percentage dissipation of energy	**04**	**C04**
4B.	The discharge in a channel with bottom width 3m is l2m3/s. If Manning's n=0.013, compute the bed slope required to be provided if, (i). The channel has vertical sides and the uniform depth of flow is 1.03m (ii).The channel has a side slope of 2H: 1V and the uniform depth of flow is 0.75m	**04**	**C04**
4C.	Derive the conditions for a hydraulically efficient rectangular channel section in open channel flow.	**02**	**C04**
5A.	A tank has two identical orifices in one of its vertical sides. The upper orifice is 3 m below the water surface and the lower one is 5 m below the water surface. If the value of C_v for each orifice is 0.96, find the point if intersection of the two jets	**03**	**C05**
5B.	A circular tank of diameter 4 m contains water up to a height of 5 m. The tank is provided with an orifice of diameter 0.5 m at the bottom. Find the time taken (i) to lower the water level from 5 m to 2 m, (ii) to completely empty the tank. Take C_d = 0.6	**03**	**C05**
5C.	An external cylindrical mouthpiece of diameter 10 cm is discharging water constant head of 8 m. Determine the discharge and the absolute pressure head of water at vena contracta. Take C_d = 0.855 and C_c for vena contracta = 0.62, Take the atmospheric pressure head as 10.3 m of water.	**04**	**C05**

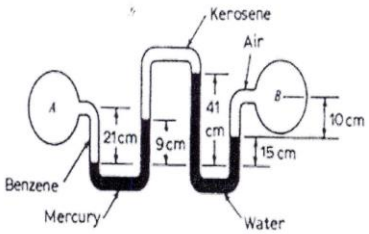

Fig. Q1A

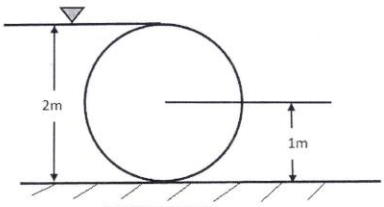

Fig. Q1C

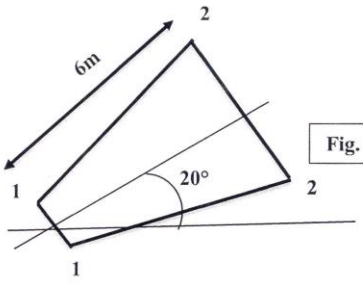

Fig. Q2B