Q. Code: 888310

Reg. No. | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Third Semester

CE18302 – MECHANICS OF FLUIDS

(Civil Engineering)

(Regulation 2018)

Time: Three Hours **Maximum : 100 Marks**

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

		CO	RBT
1.	Explain Newton's Law of Viscosity.	1	R
2.	Define Buoyancy.	1	R
3.	Define Rate of flow.	2	R
4.	What are the assumptions made in the derivation of Bernoulli's equation?	2	U
5.	State the Buckingham's π-theorem.	3	R
6.	Define Froude number.	3	U
7.	Differentiate laminar and turbulent flow.	4	U
8.	Explain the significance of Moody diagram.	4	U
9.	Define Displacement thickness.	5	R
10.	Define the terms Drag and Lift.	5	R

PART B - (5 X16 = 80 Marks)

11.	(a)	(i)	Calculate the dynamic viscosity of an oil, which is used for lubrication between a square plate of size 0.8 m x 0.8 m and an inclined plane with angle of inclination 30°. The weight of the square plate is 300N and it slides down the inclined plane with a uniform velocity of 0.3m/s. The thickness of oil film is 1.5mm.	(8)	1	AP
		(ii)	Calculate the capillary rise in a glass tube of 2.5mm diameter when immersed vertically in (a) water and (b) Mercury. Take surface tensions and σ=0.0725 N/m for water and =0.52 N/m for mercury in contact with air. The specific gravity for mercury is given as 13.6 and angle of contact =130°	(8)	1	AP
			(OR)			
	(b)	(i)	A pipe contains an oil of specific gravity 0.9. A differential manometer connected at the two points A and B shows a difference in mercury level as 15cm. Find the difference of pressure at the two points.	(8)	1	AP

		(ii) A rectangular plane surface is 2 m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surfaces when its upper edge is horizontal and 2.5m below the water surface.	**(8)**	**1**	**AP**
12.	(a)	The velocity component for a two dimensional incompressible flow are given by u =3x – 2y and v = -3y – 2x. Show that the velocity potential exists. Determine the velocity potential function and stream function.	**(16)**	**2**	**AP**
		(OR)			
	(b)	A horizontal venturimeter with inlet diameter 20 cm and throat diameter10cm is used to measure the flow of water. The pressure at inlet is 17.658 N/cm^2 and the vacuum pressure at the throat is 30cm of mercury. Find the discharge of water through Venturimeter. Take $C_d = 0.98$	**(16)**	**2**	**AP**
13.	(a)	The pressure difference Δp in a pipe of diameter D and length l due to turbulent flow depends on the velocity V, Viscosity μ and density ρ. Using Buckingham"s π theorem obtain the expression for Δp.	**(16)**	**3**	**U**
		(OR)			
	(b)	Define Following Dimensionless Numbers 1)Reynolds Number 2)Froude Number 3)Mach Number 4)Weber Number	**(16)**	**3**	**U**
14.	(a)	Derive an expression for Hagen Poisuille"s equation.	**(16)**	**4**	**U**
		(OR)			
	(b)	Derive an expression for loss of head if the pipes are connected (a) in series and (b) in parallel.	**(16)**	**4**	**U**
15.	(a)	Analyze the following boundary layer parameters for the velocity distribution $u/U = 2(y/\delta) - (y/\delta)^2$: i) Displacement thickness, ii) Momentum thickness, iii) Energy thickness	**(16)**	**5**	**U**
		(OR)			
	(b)	Derive Momentum integral Equation.	**(16)**	**5**	**U**