Q. Code: 765444

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

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Third Semester

CE18302 – MECHANICS OF FLUIDS

(Civil Engineering)

(Regulation 2018 / 2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Summarize the differences between the solid and fluid and apply the fluid properties and its behavior in static conditions to solve problems.	**3**
CO 2	Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.	**3**
CO 3	Analyze the model for flow studies and to predict the performance of prototype.	**3**
CO 4	Analyze the losses in pipe lines for both laminar and turbulent conditions.	**3**
CO 5	Apply the boundary layer concepts to find the drag force excreted by fluid on the flat solid surface.	**3**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	State Newton's law of viscosity.	**1**	**2**
2.	Distinguish between a real fluid and an ideal fluid.	**1**	**2**
3.	What is meant by velocity potential function?	**2**	**2**
4.	Differentiate compressible and incompressible flow.	**2**	**2**
5.	Distinguish between Geometric similarity and Kinematic similarity.	**3**	**2**
6.	How the fundamental quantities are involved in the dimensional analysis?	**3**	**2**
7.	Discuss the factors to be determined when viscous fluid flows through the circular pipe.	**4**	**2**
8.	Compare hydraulic gradient line with total energy line.	**4**	**2**
9.	List out the methods of preventing the separation of a Boundary layer.	**5**	**2**

10.	Recommend the boundary conditions for the velocity profiles.	**5**	**2**	

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	A liquid has a specific gravity of 0.72. Find its density, specific weight and also the weight per litre of the liquid. If the above liquid is used for lubrication between a shaft and a sleeve, find the power lost in liquid for a sleeve length of 100 mm. The diameter of the shaft is 0.5 m and the thickness of the liquid film is 1 mm. Take the viscosity of fluid as 0.5 Ns/m^2 and the speed of the shaft as 200 rpm.	**(14)**	**1**	**3**
	(OR)			
(b)	Determine the total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Also find the position of centre of pressure.	**(14)**	**1**	**3**
12. (a)	A venturimeter of inlet diameter 300 mm and throat diameter 150 mm is inserted in vertical pipe carrying water flowing in the upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 200 mm. Find the discharge if the coefficient of discharge of meter is 0.98.	**(14)**	**2**	**3**
	(OR)			
(b)	Derive the continuity equation for a three-dimensional incompressible flow.	**(14)**	**2**	**3**
13. (a)	The resisting force (R) of a supersonic flight can be considered as dependent upon length of aircraft (l), velocity (V), air viscosity „μ", air density „ρ", and bulk modulus of air „k". State the functional relationship between these variables and the resisting force.	**(14)**	**3**	**3**
	(OR)			
(b)	The efficiency of the fan depends on the density (ρ) dynamic viscosity (μ) angular viscosity (ω), diameter (D), Discharge (Q). Express efficiency in terms of dimensionless parameters using Rayleigh's method	**(14)**	**3**	**3**
14. (a)	Examine the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (i) Darcy formula, (ii) Chezy's formula for which C = 60.	**(14)**	**4**	**3**
	(OR)			
(b)	An oil of viscosity $0.1Ns/m^2$ and relative density 0.9 is flowing through a circular pipe of diameter 5cm and of length 300m. The rate of flow of fluid through the pipe is 3.5 liters/sec. Examine the pressure drop in a length of 300 m and also the shear stress at the pipe wall.	**(14)**	**4**	**3**
15. (a)	For the following velocity profiles, examine whether the flow has or on the verge of separation or will attach with the surface:	**(14)**	**5**	**3**

i) $u/U = 3/2\ (y/\delta) - 1/2\ (y/\delta)^3$, ii) $u/U = 2\ (y/\delta)^2 - (y/\delta)^3$
iii) $u/U = -\ 2\ (y/\delta) + (y/\delta)^2$

(OR)

(b)	Define the terms displacement thickness and momentum thickness and also derive an expression for the displacement thickness and momentum thickness in boundary layer with necessary assumptions.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Design the loss of head if the pipes are connected in series (compound pipes) and in parallel.	**(10)**	**4**	**3**

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