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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S,FE) (FT/WP) (S1 PT) Examination May 2025 (2019 Scheme)

Course Code: MET203

Course Name: MECHANICS OF FLUIDS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1	Differentiate Newtonian and Non-Newtonian fluid based on fluid deformation	(3)
2	Explain the variation of viscosity with temperature	(3)
3	Explain the concept of stream function.	(3)
4	Show that for an ideal flow, stream function and potential function are orthogonal	(3)
5	State Bernoulis equation and obtain the same from Eulers equation for a confined fluid flow.	(3)
6	Explain the working of notches used to measure the fluid flow rate.	(3)
7	Describe the concept of critical Reynolds number using Reynold's pipe flow visualization experiment.	(3)
8	Show that the maximum power transmission efficiency for flow through a circular pipe is 2/3	(3)
9	Differentiate laminar and turbulent boundary layers for a flow past solid surface.	(3)
10	Brief on geometric, kinematic and dynamic similarity.	(3)

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

11	Derive the expressions of centre of pressure and total pressure force acting on an inclined flat surface submerged in a fluid.	(14)
12	A cylindrical buoy is 2 m in diameter, 2.5 m long and weighs 2200 kg. The density of sea water is 1025 kg/m^3. Show that the body cannot float with its axis vertical.	(14)

Module 2

13 Find the acceleration and vorticity components at a point (1,1,1) for the following flow field (14)

$u = 2x^2 + 3y$, $v = -2xy + 3y^2 + 3zy$, $w = -1.5z^2 + 2xz - 9y^2 z$

14 Write short notes on (i) uniform flow (ii) streak line (iii) potential function and (iv) flow net (14)

Module 3

15 Explain the working of an orifice meter and obtain the expression for flow rate using energy equation. (14)

16 A pipe line carrying oil of specific gravity 0.87, changes in diameter from 200 mm diameter at a position A to 500mm diameter at a position B which is 4 m at a higher level. If the pressure at A and B are 9.81 N/cm^2 and 5.87 N/cm^2 respectively and the discharge is 200 lit/sec determine the loss of head and direction of flow. (14)

Module 4

17 Derive the Darcy-Weisbach equation for the estimation for frictional head loss for a Newtonian viscous flow through a circular pipe. (14)

18 A syphon of diameter 200 mm connects two reservoirs having a difference in elevation 15 m. The total length of the syphon is 600 m and the summit is 4 m above the water level in the upper reservoir. If the seperation takes place at 2.8 m of water absolute, find the maximum length of syphon from the upper reservoir to the summit. Take f=0.004 and atmospheric pressure = 10.3 m of water. (14)

Module 5

19 From the fundamental arguments derive the Von-Karman momentum integral equation. (14)

20 The pressure difference Δp in a pipe of diameter of diameter D and length l due to turbulent flow depends on the velocity V, viscosity μ, density ρ and roughness length scale k. Using Buckinghams π-theorem obtain the expression for Δp. (14)

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