Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S,FE) (FT/WP/S1PT) Examinations May/June 2026 (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	Define gauge pressure, vacuum pressure and absolute pressure. How are they related?	(3)
2	Distinguish between the following: i) Ideal and Real fluid ii) Poise and Stokes	(3)
3	If 10,000 litres of a certain liquid weigh 1329 N, find a)Specific weight b) Mass density	(3)
4	Write short note on the following a) Local acceleration b) Convective acceleration.	(3)
5	Distinguish between (a) Rotational & Irrotational flow (b) Compressible & incompressible flow.	(3)
6	Show that the stream lines and equipotential lines form a net of mutually perpendicular lines	(3)
7	Explain the concept of vena-contracta.	(3)
8	List any two minor energy losses.	(3)
9	Explain the significance of Reynolds Number.	(3)
10	What is the primary reason for nondimensionalizing an equation	(3)

PART B

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

Module 1

11a	The space between two square flat parallel plates is filled with oil. Each side of the plates is 800 mm. Thickness of the oil film is 20 mm. The upper plate moves at a uniform velocity of 3.2 m/s. When a force of 50 N is applied to upper plate, determine (i) Shear stress (ii) Dynamic viscosity of oil in poise (iii) Power absorbed in moving the plate (iv) Kinematic viscosity of oil if the specific gravity is 0.94	(7)
b	A simple U tube manometer containing mercury is used to find the negative pressure in the pipe, if the difference of mercury level in 2 limb is 100 mm and height of water in the left limb from the centre of pipe is found to be 40 mm below. Find the vacuum pressure in the pipe	(7)
12 a	With a neat sketch, explain the conditions of equilibrium for floating and submerged bodies	(7)
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 3m below the free surface of water. Find the position of centre of pressure also.	(7)

Module 2

13a	Derive the continuity equation in three dimensional flow	(7)
b	If for a 2 -D flow the velocity potential $\Phi = X(2Y-1)$. Determine the velocity at the point P(4,5). Determine also the value of stream function.	
14a	In a two-dimensional incompressible flow, the fluid velocity components are given by $u = x-4y$ and $v = -y-4x$. Show that velocity potential exists and determine its form. Also find the velocity at point (1, 2).	(7)
b	Define the term velocity potential function , stream function and establish the relation between them	(7)

Module 3

15a	Derive an expression for the continuity equation in Cartesian coordinates.	(7)
b	A smooth pipe of uniform diameter 25 cm, a pressure of 50 KPa was observed at section 1 which has an elevation of 10 m. At another section 2, at an elevation of 12m, the pressure was 20 KPa and the velocity was 1.25 m/s. Determine the head loss between the two sections. The fluid in the pipe is water.	(7)

16a	Explain in details about hydraulic coefficient of orifice	(7)
b	Derive the equation of discharge through a venturimeter	(7)

Module 4

17a	Derive the Darcy Weis batch equation for head loss due to friction.	(7)
b	An oil of specific gravity 0.7 is flowing through a pipe of diameter 300mm at the rate of 500 liters/s. Find the head loss due to friction and power required to maintain the flow for a length of 1000m. Take kinematic viscosity = 0.29stokes.	(7)
18a	Enumerate the concept of equivalent pipe and also obtain the Dupit's equation	(7)
b	Illustrate the phenomenon of water hammer with sketches.	(7)

Module 5

19	Derive expressions for the displacement, momentum and energy thickness in connection with the boundary layer .	(14)
20 a	List the three types of similarities and explain them.	(7)
b	Find an expression for the drag force on smooth spere of diameter D, moving with a uniform velocity V through a fluid having density ρ and viscosity μ .	(7)

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