Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S) Examinations (FT/WP) May 2026 (2024 Scheme)

Course Code: PCCET302

Course Name: FLUID MECHANICS

Max. Marks: 60 Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

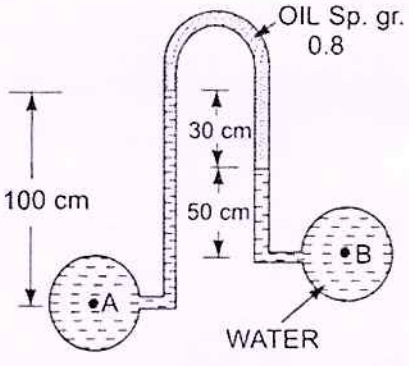
		CO	Marks
1	State and prove hydrostatic law.	CO2	3
2	Differentiate between Newtonian fluids and Non – Newtonian fluids.	CO1	3
3	Define the total pressure and centre of pressure for plane surfaces immersed in a liquid.	CO2	3
4	A wooden block of size 0.6×0.4×0.2 m (specific gravity 0.6) floats horizontally in water (depth 0.2m). Find the depth of wooden block in water.	CO3	3
5	Differentiate between i) steady and unsteady flow ii) Uniform and non uniform flow	CO2	3
6	State the assumptions behind the derivation of Bernoulli's equation and mention one practical application.	CO2	3
7	What is the difference between hydraulic gradient line (HGL) and total energy line (TEL) in pipe flow?	CO5	3
8	Differentiate between pipe flow and open channel flow.	CO5	3

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

9	a)	A hydraulic press has a ram of 30 cm diameter and a plunger of 5 cm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 500 N.	CO2	3
	b)	A simple manometer is used to measure the pressure of oil (sp.gr.=0.8) flowing in a pipe line. Its right limb is open to the atmosphere and left limb is connected to the pipe. The centre of the pipe is 11 cm below the level of mercury (sp.gr.13.6) in the right limb. If the difference of mercury level in the two limbs is 15 cm, determine the absolute pressure of the oil in the pipe.	CO2	6
10	a)	An open tank contains water up to a depth of 1.5 m and above it an oil of sp.gr. 0.8 for a depth of 2 m. Find pressure intensity:(i) at the interface of the two liquids, and (ii) at the bottom of the tank.	CO2	3
	b)	An inverted differential manometer connected to two pipes A and B containing water. The fluid in manometer is oil of sp.gr. 0.8. For the manometer readings shown in the figure, find the difference of pressure head between A and B.	CO2	6



Module -2

11	a)	A vertical sluice gate is used to cover an opening in a dam. The opening is 3 m wide and 1.2 m high. On the upstream of the gate, the liquid of sp.gr.1.45, lies up to a height of 1.5 m above the top of the gate, whereas on the downstream side the water is available up to a height touching the top of the gate. Find the resultant force acting on the gate.	CO2	5
	b)	Explain the experimental method of determination of meta-centric height.	CO3	4
12	a)	A circular plate 2.5m diameter is immersed in water, its greatest and least depths below the water surface being 3m and 1m respectively. Find a) the	CO2	4

		total pressure on one face of the plate, and b) the position of centre of pressure.		
	b)	A solid cylinder of diameter 4.0 m has a height of 6.0 m. Find the meta centric height of the cylinder if the specific gravity of the material of cylinder is 0.6 and it is floating in water with its axis vertical. State whether the equilibrium is stable or unstable.	CO3	5

Module -3

13	a)	Derive the continuity equation in 3D Cartesian coordinates.	CO2	6
	b)	Explain with figure the application of momentum equation for the determination of thrust exerted by the flowing fluid on a pipe bend.	CO4	3
14	a)	The following case represents the two velocity components, determine the third component of velocity such that they satisfy the continuity equation: $u = - 4xy - x^2y$, $v = 2y^2$	CO2	3
	b)	A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of specific gravity 0.80. The reading of the oil-mercury differential manometer is 25 cm. Determine the discharge of oil Take C_d=0.98.	CO2	6

Module -4

15	a)	A circular tank of diameter 5 m contains water up to a height of 6 m. The tank is provided with an orifice of diameter 0.5 m at the bottom. Find the time taken by water (i) to fall from 6 m to 2 m and (ii) for completely emptying the tank. Take $C_d = 0.6$.	CO2	5
	b)	Enlist the minor losses in a pipe flow and explain any four.	CO5	4
16	a)	Define critical, sub critical and super critical flow in open channels.	CO5	3
	b)	Water flows over a rectangular weir 2 m wide at a depth of 150 mm and afterwards passes through a triangular right-angled weir. Taking C_d for the rectangular and triangular weir as 0.62 and 0.60 respectively, find the depth over the triangular weir.	CO2	6

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