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: CET203
Course Name: Fluid Mechanics and Hydraulics

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1	Define pressure diagram.	(3)
2	A rectangular plane surface is 2 m wide and 3m deep. It lies in a vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and coincides with water surface	(3)
3	Differentiate between a) laminar flow and turbulent flow b) sub critical flow and super critical flow	(3)
4	Define the term a) centre of buoyancy b) metacentre	(3)
5	List any three practical applications of Bernoulli's equation.	(3)
6	Define the following terms a) coefficient of discharge b) coefficient of velocity c) coefficient of contraction	(3)
7	Differentiate hydraulic grade line from total energy line.	(3)
8	Enumerate the classification of notches.	(3)
9	Define hydraulic jump. List any two applications of hydraulic jump.	(3)
10	List the assumptions made in deriving equation for gradually varied flow.	(3)

PART B

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

Module 1

11	a)	The right limb of a simple u tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm.	(8)
	b)	Derive an expression for determining total pressure and centre of pressure on an inclined lamina immersed in a fluid.	

			(6)
12	a)	A circular opening 3m diameter on the vertical side of a tank is closed by a disc of 3 m diameter which can rotate about a horizontal diameter. Calculate a) the force on the disc b) the torque required to maintain the disc in equilibrium in the vertical position when the head of water above the horizontal diameter is 4m.	(10)
	b)	Explain the working of a single column manometer.	(4)

Module 2

13	a)	Derive an expression for continuity equation in 3D Cartesian co ordinates.	(8)
	b)	A body of dimensions 1.5m x 1.0m x 2m weighs 1962 N in water. Find its weight in air. What will be its specific gravity?	(6)
14	a)	A solid cylinder of diameter 4 m has a height of 4 m. find the metacentric height of the cylinder if the specific gravity of the material of the cylinder = 0.6 and it is floating in water with its axis vertical. State whether the equilibrium is stable or unstable.	(8) (6)
	b)	Explain the conditions of equilibrium of a floating body and a submerged body.	

Module 3

15	a)	A 25 mm diameter nozzle discharges 0.76 m^3 of water per minute when the head is 60m. the diameter of the jet is 22.5 mm. Determine the values of coefficients of a) discharge b) velocity c) contraction. Also find the loss of head due to fluid resistance.	(8)
	b)	Summarize major and minor losses in pipe flow.	(6)
16	a)	Derive an expression for determining discharge using an orificemeter.	(8)
	b)	Write a note on kinetic energy correction factor.	(6)

Module 4

17	a)	Derive an expression for determining discharge through a triangular notch or weir	(6)
	b)	A trapezoidal channel with side slope of 1 to 1 has to designed to convey 10 m^3/s at a velocity of 2 m/s so that the amount of concrete lining for the bed and the sides is the minimum. Calculate area of lining required for one metre length of the canal.	(8)
18	a)	Derive the conditions for most economical trapezoidal channel section.	(8)

b) A concrete lined circular channel of diameter 3 m has a bed slope of 1 in 500. Determine the velocity and flow rate for the conditions of 1) maximum velocity 2) maximum discharge. Assume Chezy's C = 50. (6)

Module 5

19 a) The depth of flow of water at a certain section of a rectangular channel of 2 m wide is 0.3 m. the discharge through the channel is 1.5 m^3/s. Determine whether a hydraulic jump will occur and if so find its height and loss of energy per kg of water. (10)

b) Find the critical depth and critical velocity of water flowing through a rectangular channel of width 5 m , when the discharge is 15 m^3/s (4)

20 a) Explain specific energy and specific energy curve (6)

b) Find the slope of free water surface in a rectangular channel of width 20 m, having depth of flow 5m. The discharge through the channel is 50 m^3/s. the bed of the channel is having a slope of 1 in 4000. Take Chezy's constant C = 60. (8)

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