Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

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

Course Code: CET203
Course Name: Fluid Mechanics and Hydraulics

Max. Marks: 100 Duration: 3 Hours

Assume any missing data suitably.

PART A

Answer all questions. Each question carries 3 marks Marks

1	Define the following terms: (*i*) Total pressure, and (*ii*) Centre of pressure.	(3)
2	An inverted differential manometer containing an oil of sp. gravity 0.9 is connected to find the difference of pressures at two points of a horizontal pipe containing water. If the manometer reading is 400 mm, find the difference of pressures.	(3)
3	Explain the terms metacentre and metacentric height.	(3)
4	Distinguish between: (i) Steady flow and Unsteady flow. (ii) Uniform flow and Non uniform flow.	(3)
5	What are the assumptions considered in the derivation of Euler'sequation of motion?	(3)
6	Differentiate between major and minor losses in a pipeline.	(3)
7	A Cipolletti weir has a crest length of 0.25 m and the head on the crest is 0.15m. Calculate the discharge flowing over it if coefficient of discharge is 0.64.	(3)
8	Obtain the conditions for the most economical rectangular channel section.	(3)
9	Define the terms i) specific energy and ii) critical depth.	(3)
10	State the assumptions involved in the derivation of dynamic equation for gradually varied flow.	(3)

PART B

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

Module 1

11a	How are manometers classified?	(3)
11b	A square lamina of 1 m side is immersed in water with one of its diagonal	(11)

vertical and topmost vertex 1 m below the free surface. Find the total pressure and the position of centre of pressure.

12a Explain the principle of manometers used for pressure measurement. (3)

b A triangular plate of 1 metre base and 1.5 m altitude is immersed in water. The plane of the plate is inclined at 30° with free water surface and the base is parallel to and at a depth of 2 m from water surface. Find the total pressure on the plate and the position of centre of pressure. (11)

Module 2

13a Explain the experimental method for the determination of metacentric height. (4)

b A solid cylinder 2 m in diameter and 2 m high is floating in water with its axis vertical. If the specific gravity of the cylinder is 0.65 find its metacentric height and analyse the stability of the cylinder. (10)

14a Derive the continuity equation for one dimensional flow. (6)

b The velocity vector in an incompressible flow is given by V= (yz + t)i + (xz - t)j + (xy)k. (i)Verify whether continuity equation is satisfied. (ii) Determine the acceleration and velocity at point A (1,2,3) at t =1. (8)

Module 3

15a State Bernoulli's theorem. (3)

b The velocity distribution in a pipe of radius R is given by $v = V_{max}(1 - \frac{r^2}{R^2})$ where V_{max} is the maximum velocity at the centreline of the pipe and v is the velocity at radius r from the centre of the pipe. Determine the kinetic energy correction factor (11)

16a Explain the experimental determination of hydraulic coefficients of an orifice. (7)

b A compound piping system consists of three pipes of the same material arranged in series; the lengths of the pipes are 1200 m, 1800 m and 600 m and diameters 40 cm, 50 cm and 30 cm respectively. (i) Obtain the equivalent length of a 40 cm pipe of the same material, and (ii) Determine the equivalent size of a similar pipe 3600 m long. (7)

Module 4

17a A 30 m long weir is divided into 10 equal bays by vertical posts, each 0.6 m wide. Taking C_d = 0.623, calculate the discharge over the weir if the head over the crest is 1 m. Neglect velocity of approach. (6)

b Derive Chezy's equation for uniform flow in open channel. (8)

18a	For a trapezoidal channel with bottom width 6 m and side slopes of 2 horizontal to 1 vertical, the bottom slope is 0.0016. If it carries a uniform flow of water at the rate of 10 m^3/s, determine the normal depth. Take Manning's coefficient as 0.025	(9)
b	Compare with figures open channel flow and pipe flow.	(5)

Module 5

19a	Sketch the water surface profiles occurring in mild slope channel and steep slope channel.	(7)
b	A rectangular channel has a width of 10 m and carries a discharge of 30 m^3/s at a depth of 2 m. Calculate i) specific energy of water flowing through the channel ii) critical depth and critical velocity iii) specific energy at critical depth.	(7)
20a	Derive the expression for conjugate depths and energy loss associated with hydraulic jump in rectangular channels.	(10)
b	Define i) backwater curve ii) alternate depths	(4)

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