

CBCS SCHEME

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BCV402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026 Fluid Mechanics and Hydraulics

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

		Module - 1	M	L	C
Q.1	a.	Write short note on: i) Surface tension ii) Dynamic viscosity iii) Specific gravity	6	L1	CO1
	b.	State and prove Pascal's law.	6	L2	CO1
	c.	An isosceles triangular plate of base 4 m and altitude 6 m is immersed vertically in water. Its axis of symmetry is horizontal to and at a depth of 6 m from the free water surface. Determine the total pressure and the position of the centre of pressure.	8	L3	CO1

OR

Q.2	a.	Define the following: i) Absolute pressure ii) Gauge pressure iii) Gauge vacuum iv) Atmospheric pressure indicates their relative position with a neat diagram.	6	L1	CO1
	b.	One litre of crude oil weight 9.6 N. Calculate its specific weight, density and specific gravity.	6	L2	CO1
	c.	A circular plate of 2 m diameter is submerged in water such that its greatest and smallest depth below the free water surface are 2 m and 1 m respectively. Find: i) Total pressure acting on the plate ii) Depth of the centre of pressure	8	L3	CO1

Module – 2

Q.3	a.	Difference between : i) Compressible and incompressible flow ii) Stream line and streak line iii) Rotational and irrotational flow	6	L1	CO2
	b.	Derive the continuity equation in Cartesian co-ordinates for three dimensional flows.	6	L2	CO2
	c.	The velocity potential function (ϕ) is given by an expression $\phi = -\frac{xy^3}{3} - x^2 + \frac{x^3y}{3} + y^2$ i) Find the velocity components in x and y direction ii) Show that ϕ represents a possible case of flow.	8	L3	CO2

OR

Q.4	a.	State the Bernoulli's theorem and list the assumptions made in deriving the Bernoulli's equation.	6	L1	CO2
	b.	Derive the expression for rate of flow of fluid through a horizontal venturimeter.	6	L2	CO2
	c.	The stream function for a two dimensional flow is given by $\psi = 8xy$, calculate the velocity at the point p(4, 5). Find the velocity potential function (ϕ).	8	L3	CO2

Module – 3

Q.5	a.	Explain different hydraulic coefficients and establish the relation between them.	4	L2	CO3
	b.	Derive the expression for discharge over a triangular notch.	8	L2	CO3
	c.	An oil of specific gravity 0.7 is flowing through a pipe of diameter 300 mm at the rate of 500 litre/sec. Find the head lost due to friction and power required to maintain the flow for a length of 1000 m. Take kinematic viscosity = 0.29 stokes.	8	L3	CO3

OR

Q.6	a.	Water discharges through a rectangular notch 1.2 m wide under a head of 50 m. If the same discharge is allowed to flow through a 120° V – notch. Take the coefficients of discharge same in both notches.	4	L2	CO3
	b.	Explain the following : i) Major and minor losses in pipes ii) Concept of water hammer iii) Lippoletti notch iv) Advantage of a triangular notch over a rectangular notch	8	L2	CO3
	c.	Three pipes of same length L, diameter D and friction factor f are connected in parallel. Determine the diameter of the pipe of length L and friction factor of which will carry the same discharge for same head loss. Use $h_f = \frac{fLV^2}{2gD}$	8	L3	CO3
Module – 4					
Q.7	a.	Define the most economical channel cross section conditions and arrive at the maximum discharge condition for a trapezoidal channel.	6	L2	CO4
	b.	With neat sketches explain the classification of open channel flows.	8	L2	CO4
	c.	Design an earthen trapezoidal channel with velocity of flow 1.2 m/s to discharge $6 \text{ m}^3/\text{s}$. The side slopes are 1 in 2. Take $C = 50$.	6	L3	CO4
OR					
Q.8	a.	Write short note on : i) Hydraulic jump ii) Specific energy curve iii) Gradually varied flow types iv) Hydraulic mean depth	8	L2	CO4
	b.	A channel width side with slopes at 45° is to have a cross-section of 12.8 m^2 . Determine the dimensions for the best section.	4	L2	CO4
	c.	Derive the conditions for a most economical rectangular channel cross-section.	8	L3	CO4

Module – 5

Q.9	a.	Obtain an expression for force exerted by a jet striking at the center of a moving symmetrical curved vane.	5	L2	CO5
	b.	With a neat sketch explain the working of a Pelton wheel.	5	L2	CO5
	c.	A Francis turbine with an overall efficiency of 70% is required to produce 147.15 kW. It is working under a head of 8 m. The peripheral velocity = $0.3\sqrt{2gH}$ and radial velocity of flow at the inlet is $0.96\sqrt{2gH}$. The wheel runs at 200 rpm and the hydraulic losses in the turbine are 20% of the available energy. Assume radial discharge, determine : i) Guide blade angle ii) The wheel vane angle at inlet iii) Diameter of the wheel at inlet iv) Width of wheel at inlet	10	L3	CO5
OR					
Q.10	a.	State impulse-momentum equation and give its applications.	4	L2	CO5
	b.	Explain the components and working of a centrifugal pump with a neat sketch.	8	L2	CO5
	c.	A jet of water having a velocity of 15 m/s strikes a curved vane which is moving with a velocity of 6 m/s in the same direction as that of the jet at inlet. The vane is so shaped that the jet is deflected through 135° . The diameter of the jet is 150 mm. Assuming the vane to be smooth, find : i) the force exerted by the jet on the vane in the direction of motion ii) Power of the vane iii) Efficiency of the vane.	8	L3	CO5
