CBCS SCHEME

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BCV402

Fourth Semester B.E./B.Tech Degree Supplementary Examination, June/July 2024

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.	Define the following and write their SI units. i) Density ii) Specific weight iii) Surface Tension iv) Capillarity.	6	L1	CO1
	b.	Derive an expression for capillary rise/fall of fluid in a tube of small diameter with sketches.	6	L2	CO2
	c.	Determine the minimum size of glass tube that can be used to measure water level, if the capillary rise in the tube is not to exceed 0.25mm. Take surface tension of water in contact with Air as 0.0735N/m.	8	L2	CO1
		OR			
Q.2	a.	State and prove Pascal's law.	6	L1	CO1
	b.	Define the following and mention their SI units. i) Total pressure ii) Centre of pressure.	6	L2	CO2
	c.	Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4m and altitude 4m. When it is immersed vertically in an oil of specific gravity 0.9. The base of plate coincides with the free surface of oil.	8	L3	CO2
		Module – 2			
Q.3	a.	Differentiate between : i) Uniform and non uniform flow ii) Steady and unsteady flow.	6	L2	CO2
	b.	Derive continuity equation for a three dimensional flow in Cartesian co-ordinates.	8	L2	CO2
	c.	The stream function for a two dimensional flow is given by $\psi = 2xy$, calculate the velocity at the point P(2, 3). Find the velocity potential function ϕ.	6	L3	CO2
		OR			
Q.4	a.	Obtain an expression for Euler's equation of motion along a stream line and deduce it to Bernoulli's equation.	10	L2	CO2
	b.	An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20cm and throat diameter 10cm. The oil mercury differential manometer shows a reading of 25cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$.	10	L3	CO2

		Module – 3			
Q.5	**a.**	Explain the classification of Notches and mouthpieces.	**6**	**L2**	**CO3**
	b.	Define hydraulic co-efficient (C_c, C_d, C_v) of an orifice and obtain the relation between them.	**6**	**L2**	**CO3**
	c.	Water flows over a rectangular Notch 1m wide at a depth of 150mm and after words passes through a triangular right angled notch. Taking c_d for the rectangular and triangular notch as 0.62 and 0.59 respectively. Find the depth over the triangular notch.	**8**	**L3**	**CO3**
		OR			
Q.6	**a.**	Explain major and minor losses in a pipe flow. Derive an expression for head loss due to sudden expansion in pipe line.	**10**	**L2**	**CO2**
	b.	Find the loss of head when a pipe of diameter 200mm is suddenly enlarged to a diameter of 400mm. The rate of flow of water through the pipe is 250 lit/sec.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Define the most economical channel section. Derive an expression for most economical rectangular section.	**10**	**L1**	**CO4**
	b.	A rectangular channel carries water at the rate of 400 lits/sec when bed slope is 1 in 2000. Find the most economical dimensions of the channel if C = 50.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Define specific energy. Draw and explain specific energy curve.	**6**	**L3**	**CO4**
	b.	Define : i) Gradually Varied Flow (GVF) ii) Rapidly Varied Flow (RVF).	**6**	**L3**	**CO4**
	c.	Find the specific energy of flowing water through a rectangular channel of width 5m. When the discharge is $10m^3$/sec and depth of water is 3m.	**8**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Define impulse momentum equation and give its applications with some examples.	**10**	**L2**	**CO4**
	b.	Define turbine. Give its classifications. Also explain heads and efficiencies of Pelton turbine.	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	Draw a neat of Kaplan turbine and explain its different parts.	**10**	**L3**	**CO4**
	b.	A Pelton wheel is to be designed for following specifications : Shaft power = 11,773KW, Head = 380mts speed = 750rpm. Overall efficiency = 86% jet diameter not to exceed $1/6^{th}$ of wheel diameter. Determine : i) The wheel diameter ii) Number of jets required iii) Diameter of jet take $K_{v_1} = 0.985$ and $K_{u_1} = 0.45$.	**10**	**L3**	**CO4**

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