

Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

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Fourth Semester B.E. Degree Examination Applied Hydraulics

TIME: 03 Hours

Max. Marks: 100

Note: Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

Module -1			*Bloom's Taxonomy Level	Marks
Q.01	a	Define the terms: i) Model ii) Prototype iii) Model analysis iv) Hydraulic similitude.	L1,L2 CO1, PO1	06
	b	Define i) Centre of buoyancy ii) Metacenter. How these are used to identify the equilibrium condition of floating bodies	L1,L2 CO1,PO1	06
	c	An oil of specific gravity 0.92 and viscosity 0.03 poise is to be transported at the rate of 2500 litres/sec. through a 1.2 m diameter pipe. Tests were conducted on a 12 cm diameter pipe using water at 20°C. If the viscosity of water at 20°C is 0.01 poise find: i) Velocity of flow in the model ii) Rate of flow in the model.	L1,L4 CO1,PO1,PO2	08
OR				
Q.02	a	Distinguish between: i) Geometric and Kinematic similarity ii) Distorted and Undistorted models iii) Reynold's and Froude's Number	L1,L2 CO1, PO1	06
	b	A block of wood of specific gravity 0.7 floats in water. Determine the meta-centric height of the block if its size is 2m x 1m x 0.8 m.	L1,L5 CO1,PO1,PO2	06
	c	Using Buckingham's π -theorem show that the velocity through a circular orifice is given by $V = \sqrt{2gH} \phi \left[\frac{D}{H}, \frac{\mu}{\rho V H} \right]$ Where H is the head causing the flow, D is the diameter of orifice, μ is the coefficient of viscosity, ρ is the mass density and g is the acceleration due to gravity.	L1,L2,L3 CO1,PO1,PO2	08
Module-2				
Q. 03	a	Define open channel flow. With a neat sketches differentiate between pipe flow and open channel flow.	L1,L2 CO2,PO1	06
	b	Derive Chezy's equation for discharge through uniform flow in open channel.	L1,L2,L3 CO1,PO1,PO2	06
	c	A 3m wide rectangular channel carries 2.4 m ³ /s discharge at a depth of 0.7m. Determine : i) Specific Energy at 0.7 m depth ii) Critical depth iii) Alternate depth to 0.7 m	L1,L5 CO3,PO1,PO2	08
OR				
Q.04	a	Define most economical section. Derive the condition for the most economical trapezoidal channel section.	L1,L2,L3,L4 CO2,PO1,PO2	06
	b	What is specific energy curve? Draw specific energy curve and then derive expression for critical depth and critical velocity.	L1,L2,L3,L4 CO3,PO1,PO2	06
	c	A trapezoidal canal has side slope 1:1. It is require discharging 13.75 m ³ /sec of water with a bed slope of 1 in 1000. For unlined canal, the value of Chezy's C is 44 & for lined canal, the value of Chezy's C is 60. The cost per m ³ of excavation is 4times the cost per m ² of lining. The channel has to be the most efficient one. Find whether the lined canal or unlined canal will be cheaper. What will be dimensions of that economic canal?	L2,L4 CO2,PO1,PO2	08

Module-3				
Q. 05	a	Define Hydraulic jump? Give the practical applications of hydraulic jump	L1,L2 CO3,PO1	06
	b	Find the slope of free water surface in a rectangular channel of width 20 m having depth of flow 5 m. The discharge through the channel is 50 m ³ /s. The bed of the channel is having a slope of 1 in 4000. Take the value of Chezy's constant C= 60.	L1,L2,L3 CO4,PO1,PO2	06
	c	Derive the relationship between conjugate depths in case of hydraulic jump on a horizontal floor.	L2,L3 CO3,PO1,PO2	08
OR				
Q. 06	a	With neat sketch explain backwater curve and afflux.	L2,L3 CO4,PO1	06
	b	A horizontal rectangular channel 4 m wide carries a discharge of 16 m ³ /s. Determine whether a jump may occur at an initial depth of 0.5m or not. If a jump occurs, determine the sequent depth to this initial depth. Also determine the energy loss in the jump.	L2,L3,L4 CO4,PO1,PO2	06
	c	Explain the classification of surface profiles in an open channel with neat sketches.	L2,L3,L4 CO4,PO1,PO2	08
Module-4				
Q. 07	a	Show that the efficiency of the jet striking normally on series of flat plates mounted on the periphery of wheel is 50%.	L1,L2,L3,L4 CO5,PO1,PO2	06
	b	A 15 m/sec velocity jet of water 5 cm in diameter strikes perpendicularly a flat smooth plate. Determine the force exerted by the jet on the plate, if (i) the plate is at rest (ii) it moves in the direction of jet with a velocity of 5 m/sec. Also determine the work done in each case & the efficiency of the jet in the second case.	L1,L2,L3,L4 CO5,PO1,PO2	06
	c	Design a Pelton Wheel for a head of 80 m & speed 300 rpm. The Pelton wheel develops 103 kW shaft power. Take CV = 0.98, Speed ratio = 0.45 & Overall efficiency = 80%.	L1,L2,L3,L6 CO5,PO1,PO3	08
OR				
Q. 08	a	Draw a neat sketch of a layout of hydroelectric plant & explain the terms including various heads & efficiencies	L1,L2,L3 CO5,PO1,PO2	06
	b	Obtain an expression for maximum efficiency of an impulse turbine giving the relationship between the jet speed and bucket speed.	L2,L3,L4 CO5,PO1,PO2	06
	c	A jet of water having a velocity of 40 m/s strikes a curved vane, which is moving with velocity 20m/s. the jet makes an angle of 300 with the direction of motion of vane at inlet and leaves at angle of 900 to the direction of motion of vane at outlet. Draw the velocity triangles at inlet and outlet and Find (i) The vane angle at inlet and outlet (ii) Work done per N of water (iii) Hydraulic efficiency	L2,L3,L4 CO5,PO1,PO2	08
Module-5				
Q. 09	a	Draw a neat sketch of Kaplan turbine and mention the parts.	L1,L2,L3 CO5,PO1	06
	b	Define draft tube? Explain its function. Draw the neat sketches of types of draft tubes.	L1,L2,L3 CO5,PO1	06
	c	A Kaplan turbine runner is to be designed to develop 7350 kW power under a head of 5.5 m with overall efficiency = 85%, Boss diameter = 1/3 diameter of runner, speed ratio = 2.1, Flow ratio = 0.7. Determine: (i) diameter of runner and boss (ii) speed.	L2,L3,L4 CO5,PO1,PO3	08
OR				
Q. 10	a	Define i) Manometric head ii) Static head iii) Suction head iv) Delivery head	L1,L2,L3 CO5,PO1	06
	b	Derive an expression for minimum starting speed of a centrifugal pump.	L2,L3,L4 CO5,PO1,PO2	06

	c	A centrifugal pump runs at 1000 rpm and delivers water against a head of 15 m. The impeller diameter and width at the outlet are 0.3 m and 0.05 m respectively. The vanes are curved back at 30°. Manometric efficiency = 92%. Find Discharge	L2,L3,L4 CO5,PO1,PO2	08
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*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.