Model Question Paper-2 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: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02. Assume suitable data , if required
03. Neat figurescarriesweightage.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	What is Dimensional Homogeneity?Identify whether following equations are dimensionally homogeneous or not i)$V= (\sqrt{2g H})$ ii)$V= C \sqrt{mi}$ iii)$H_f= fLV^2/2gD$ iv) $Q= 2/3\ C_d L\sqrt{2g}\ H^{3/2}$	L2/CO1/PO1	06
	b	Explain Rayleigh's method of Dimensional Analysis and also state what is the lacuna in this method .The Resisting force R of a supersonic plane during flight can be considered as dependent on the length of the aircraft l , velocity V, air viscosityμ , air density ρ , and bulk modulus of air K. Explain functionalrelation ship between these variables and the Resisting force.	L3/ CO1/PO2	09
	c	In 1 in 40 model of a spillway, the velocity and discharge are 2.5m/s and 3 m^3/s. Determine the corresponding velocity and Discharge in the prototype.	L2/ CO1/PO2	05
		OR		
Q.02	a	How do you select repeating Variables in Bucking ham π 's Theorem? Explain Geometric, Kinematic and Geometric similarities	L2/ CO1/PO2	06
	b	Explain following model laws and also state their applications i) Reynolds model Law ii) Froude model law	L2/ CO1/PO2	08
	c	Differentiate between stable and Unstable equilibrium with respect to submerged body. A rectangular barge is 5m long , 3m wide and 1.20 m high. The depth of immersion of the barge is 0.8m in sea water. If the centre of gravity is 0.6 m above the bottom of the barge, calculate the meta-centric height.	L2/ CO1/PO2	06
		Module-2		
Q. 03	a	Explain following types of flow in open channels i) Uniform and Non Uniform ii)Sub -critical and Super critical flow iii)Laminar and Turbulent flow	L2/CO2/PO1	06
	b	A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the side slope of the bed is 1in 2000.The area of the cross section is $40m^2$. Find the dimensions of the section if it is most economical. Also find the discharge of this most economical section if C= 55.	L3/ CO2/PO2	06
	c	Find the discharge through a circular pipe of diameter 3.0m, if the depth of water in the pipe is 1.0 m and the pipe is laid at a slope of 1in 1000. Take C= 65	L3/ CO2/PO2	08
		OR		
Q.04	a	Derive Chezy's formula in open channel and also state the relation between Chezy's and manning 's equation	L2/ CO2/PO2	06
	b	Show that for the most economical Trapezoidal section i) Half the top width is equal to the one of the sloping side ii)Hydraulic mean depth is equal to half the depth of flow.	L3/ CO2/PO2	08
	c	The rate of flow of water through a circular channel of diameter 0.6m is 150 lit/sec . Find the slope of the bed of the channel for maximum velocity . Take C=60.	L3/ CO2/PO3	06

		Module-3		
Q. 05	a	What is Specific energy curve? Draw the specific energy curve, and hence derive expressions for critical depth and critical velocity	L2/ CO2/PO2	09
	b	A sluice gate discharges water in to a horizontal rectangular channel with a velocity of 10m/s and depth of flow of 1m. determine the depth of flow after the jump and consequent loss in total head.	L3/ CO2/PO2	06
	c	Find the slope of the free water surface in a rectangular channel of width 20m,having depth of flow 5m.The discharge through the channel is 50 m^3/s.The bed of the bed channel is having aslope of 1in 4500.Take the value of Chezy's constant C=60.	L3/ CO2/PO3	05
		OR		
Q. 06	a	The specific energy for a 5m wide rectangular channel is to be 4Nm/N. If the rate of flow of water through the channel is 20m^3/sec, determine the alternate depths of flow.	L3/CO3/PO2	06
	b	Derive the expression for depth of Hydraulic jump in terms of Upstream Froude Number.	L3/ CO3/PO1	08
	c	Draw the different water profiles for the following i) Mild ii) Critical and iii) Horizontal	L3/ CO3/PO3	06
		Module-4		
Q. 07	a	A jet of water of diameter 75mm moving with velocity of 30m/s , strikes a curved fixed plate tangentially at one end at an angle of 30 to the horizontal. The jet leaves the plate at an angle of 20^0 to the horizontal. Find the force exerted by the jet on the plate in the horizontal and vertical direction.	L2/ CO4/PO2	06
	b	Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50%.	L3/ CO4/PO2	06
	c	Draw the layout of a Hydro-electric power plant . Explain i) Hydraulic efficiency ii)Overall Efficiency	L2/ CO5/PO1	08
		OR		
Q. 08	a	A jet of water of diameter 7.5cm strikes a curved plate at its center with a velocity of 20m/s . The curved plate is moving with a velocity of 8m/s in the direction of the jet. The jet is deflected through an angle of 165^0. assuming the loss of energy due to impact is zero, calculate (1)Force exerted on the plate in the direction of jet, ii) Power of the jet, and (iii) Efficiency of the Jet	L4/ CO4/PO3	08
	b	How do you classify the turbines? With a sketch explain the parts of a Pelton turbine.	L2/CO5/PO1	06
	c	A Pelton wheel is to be designed for the specifications shown below-Shaft power= 11,772 KW: Head =380 meters: Speed= 750 r.p.m; Overall efficiency = 86%; Jet diameter is not to exceed one-sixth of the wheel diameter. Determine : (1)The wheel diameter 9 (ii) The number of jets required , and (iii)Diameter of the jet. Assume Co-efficient of velocity=0.985, Speed ratio = 0.45	L4/CO5/PO3	06
		Module-5		
Q. 09	a	Explain with a neat sketch components of Kaplan turbine	L2/CO5/PO1	06
	b	A water turbine has a velocity of 6m/s at the entrance to the draft tube anda velocity of 1.2m/s at the exit. For friction losses of 0.1 m an d a tail water 5m below the entrance to the draft tube, find the pressure head at the entrance.	L3/CO5/PO2	O6
	c	A centrifugal pump is to discharge 0.118m^3/s at a speed of 1450 rpm against a head of 25m.The impeller diameter is 250mm , its width at outlet is 50mm and manometric efficiency is 75%. Compute the vane angle at the outer periphery of the impeller.	L3/CO5/PO2	08
		OR		

Q. 10	a	Explain with neat sketches working principle of Multistage Centrifugal Pumps for i)High Heads ii)For High Discharge	L2/CO5/PO1	06
	b	The diameters of an impeller of a centrifugal pump at inlet and outlet are 30cm and 60cm respectively. Determine the minimum starting speed of the pump if it works against a head of 30m.	L2/CO5/PO2	06
	c	A reaction turbine works at 450 rpm under a head of 120 meters . Its diameter at inlet is 120cm and the flow are is 0.4 m^2.The angles made by absolute and relative velocities at inlet are 20^0 and 60^0 respectively with the tangential velocity. Determine :i) The volume flow rate, (b)The power developed , and (c) Hydraulic efficiency.	L4/CO5/PO3	08

*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.