Register Number:……..

KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

First Semester

CIVIL ENGINEERING

U18CEI4201: Applied Hydraulics and Hydraulic Machinery

COURSE OUTCOMES

CO1: Design most economical section for an open channel.
CO2: Analyse critical flow condition in channels.
CO3: Determine GVF profiles.
CO4: Select appropriate type of turbines for the given conditions.
CO5: Assess the characteristics of pumps and turbines.
CO6: Perform experiments in flow though pipes.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Differentiate open channel flow from pipe flow.	CO1	[K_2]
2.	On what condition most economical trapezoidal channel section is derived?	CO1	[K_2]
3.	Compute the hydraulic mean depth of a small channel 1m wide, 0.5m deep with water flowing at 2m/s.	CO2	[K_3]
4.	What are the factors affecting Manning's roughness coefficient.	CO2	[K_1]
5.	State the condition for maximum velocity in circular channel.	CO3	[K_2]
6.	In a rectangular channel, the depth of flow is 1.6 m and the specific energy at the section is 2.7 m, what its flow?	CO3	[K3]
7.	Differentiate between normal depth and alternate depth.	CO3	[K_2]
8.	Give examples of reaction turbine.	CO4	[K_1]
9.	What is the purpose of providing a casing in turbines?	CO4	[K_2]
10.	Why cavitation is considered as undesirable phenomenon in pumps?	CO5	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	What are the geometric properties for the analysis of open channel.	4	CO1	[K2]
	b)	For a unlined trapezoidal irrigation canal in firm loam soil, the slope is 0.0006, flow is 100 cfs and Vmax is 2.5 ft/s, determine its dimensions.	12	CO1	[K_3]
12.	a)	A Trapezoidal channel has a bottom width of 6 m and side Slopes of 1:1. When the depth of the flow is 2 m. The flow is 24 m 3 /s. What is the Specific energy of flow? Is the Flow is sub critical or super critical.	8	CO2	[K_3]
	b)	Draw the specific curve, regimes of flow and explain it.	8	CO2	[K_2]
13.	a)	What are the assumptions made for analyzing gradually varied flow.	4	CO3	[K_2]
	b)	In a rectangular channel of bed width 0.5m, a hydraulic jump occurs at a point where the depth flow is 0.15 m and Froude's number is 2.5, Determine i.The Specific energy ii.The critical depth iii.The subsequent depth iv.Loss of head and v. energy dissipated .	12	CO4	[K_3]
14.	a)	A river 100 m wide and 3m deep has an average bed slope of 0.0005. Estimate the length of the GVF profile produced by a low weir which raises the water surface just upstream of it by 1.5 m. Assume N = 0.035. Use direct step method with three steps. To estimate the length of the GVF profile.	10	CO3	[K_3]
	b)	A turbine is to operate under a head of 25 m at 200 rpm. The discharge is 9 cumec. If the overall efficiency is 90%, determine i.Power generated ii. Specific speed iii. Type of turbine.	6	CO4	[K_3]
15.	a)	A Kaplan turbine plant develops 3000 kW under a head of 10 m. While running at 62.5 rpm. The discharge is 350 m3/s. The tip diameter of the runner is 7.5 m and the hub to tip ratio is 0.43. Calculate the specific speed, turbine efficiency, the speed ratio and flow ratio.	5	CO4	[K3]
	b)	A Francis turbine developing 16120 kW under an a head of 260 m runs at 600 rpm. The runner outside diameter is 1500 mm and the width is 135 mm. The flow rate is 7 m3 /s. The exit velocity at the draft tube outlet is 16 m/s. assuming zero whirl velocity at exit and neglecting blade thickness determine the overall and hydraulic efficiency and rotor blade angle at inlet. Also find the guide vane outlet angle:	11	CO4	[K_L]
16.	a)	Write a brief note on the characteristics of the centrifugal pump.	6	CO5	[K_2]
	b)	The following details refer to a centrifugal pump. Outer diameter : 30 cm. Eye diameter : 15 cm. Blade angle at inlet : 30°. Blade angle at outlet : 25°. Speed 1450 rpm. The flow velocity remains constant. The whirl at inlet is zero. Determine the work done per kg. If the manometric efficiency is 82%, determine the working head. If width at outlet is 2cm, determine the power o = 76%.	10	CO5	[K3]