



R20 Regulation

Subject code: 3P4AD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, December 2025

**HYDRAULICS & HYDRAULICS MACHINES
(CE)**

Maximum Marks: 70

Date: 23.12.2025

Duration: 3 hours

- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	What is the purpose of providing bed slope in open channels?	2M	1	L1
2	What is a specific energy curve?	2M	1	L1
3	What are limitations of hydraulic similitude?	2M	2	L1
4	Write the different dimensionless numbers.	2M	2	L1
5	List out the applications of impact of free jets.	2M	3	L1
6	Write the expressions for work done.	2M	3	L1
7	What is surge tank?	2M	4	L1
8	Define the hydraulic efficiency.	2M	4	L1
9	Write the classification of turbines.	2M	5	L1
10	Define utilization factor and capacity factor.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	A canal of trapezoidal section has bed width of 7 m and bed slope of 1 in 3500. If the depth of flow is 2.7 m and side slopes of the channel are 1 horizontal to 3 vertical, determine the average flow velocity and the discharge carried by the channel. Also compute the average shear stress at the channel boundary. Take value of Chezy's constant = 50.	10M	1	L2
OR				
12	A wide channel laid to a slope of 1 in 900 carries a discharge of 3 m ³ /s per meter width at a depth of 1.8 m. Find out the value of Chezy's constant C. Consider the flow to be uniform. If the actual depth varies from 1.5 m at an upstream location to 1.7 m at a location 300 m downstream or in other words the flow is gradually varied, what will be the value of Chezy's coefficient C.	10M	1	L2
13	A 120 m long surface vessel is to be tested by a 3 m long model. If the vessel travels at 10 m/s, at what speed must model be towed for dynamic similarity between the model and prototype? If the drag of the model is 9.37 N, What prototype drag is to be expected?	10M	2	L2

	OR			
14	The Resisting force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft l, velocity V, air viscosity μ , air density ρ and bulk modulus of air K. Express the functional relationship between these variables and resisting force.	10M	2	L2
15	Derive the expression for force exerted by a jet on stationary inclined flat plate.	10M	3	L2
	OR			
16	Show that the force exerted by a jet of water on moving inclined plate in the direction of jet is given by $F_x = \rho a(V-u)^2 \sin^2\theta$	10M	3	L2
17	Explain the working of draft tube with neat sketch and how do the losses in the draft tube effect the pressure at runner exit.	10M	4	L2
	OR			
18	An impulse turbine of 2.75 m diameter is rated at 11000kW at 300 r.p.m under a head of 490 m. It uses 2.7 m ³ /sec discharge if the turbine is operated under a head of 400 m. (a) Calculate the speed, power and discharge. (b) Determine the size of the wheel to develop 7000kW power under a head of 300 m. Also determine the speed and discharge.	10M	4	L2
19	Define a centrifugal pump. Explain the working of a single -stage centrifugal pump with sketches.	10M	5	L2
	OR			
20	Define the specific speed of the turbine and also derive the expression for the specific speed of the centrifugal pump.	10M	5	L2