



R22 Regulation

Subject code:4E4AD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, December 2025

HYDRAULICS & HYDRAULIC MACHINERY

(CE)

Maximum Marks: 60

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 10 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 (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	Differentiate between subcritical flow and supercritical flow.	1M	CO1	BT2
b)	Give the use of Bazin's formula.	1M	CO1	BT1
c)	What is dynamic similarity?	1M	CO2	BT1
d)	Compare a model with prototype.	1M	CO2	BT2
e)	List out the applications of impact of free jets.	1M	CO3	BT1
f)	State the principle of Angular momentum.	1M	CO3	BT1
g)	Give the use of surge tanks in turbines.	1M	CO4	BT1
h)	Present any two differences between Francis and Kaplan turbines.	1M	CO4	BT2
i)	Present the disadvantages of a reciprocating pump over a centrifugal pump.	1M	CO4	BT1
j)	List out the parts of a reciprocating pump.	1M	CO4	BT1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	a) Find the discharge through a rectangular channel of width 2 m having a bed slope of 4 in 8000. The depth of flow is 1.5 m. Take the value of N in Manning's formula as 0.012. (6)	6M	CO1	BT2
	b) Derive the dynamic equation for GVF. (4)	4M		
OR				
3	Derive the condition for most efficient Trapezoidal channel section for uniform flow.	10M	CO1	BT2
4	a) State Buckingham's pi-theorem. What are repeating variables? How are these selected by dimension analysis?	5M	CO2	BT2
	b) For laminar flow in a pipe, the drop in pressure ΔP is a function of the pipe length L, its diameter D, mean velocity of flow V and the dynamic viscosity. Using Rayleigh's method, develop an expression for ΔP .	5M		
OR				

5	a) What is meant by geometric, kinematic and dynamic similarities? Are these similarities truly attainable? If not why? b) Define the following non-dimensional numbers: Reynold's number, Froude's number and Mach's number. Give their significance for fluid flow problems.	5M 5M	CO2	BT3
6	A jet of water having a velocity of 30 m/s strikes a series of radial curved vanes mounted on a wheel which is rotating at 200 rpm. The jet makes an angle of 20 degrees with the tangent to the wheel at inlet and leaves the wheel with a velocity of 5 m/s at an angle of 130 degrees to the tangent to the wheel at outlet. Water is flowing from outward in a radial direction. The outer and inner radii of the wheel are 0.5 m and 0.25 m respectively. Find vane angles at inlet and outlet. Work done per unit weight of water and efficiency of the wheel.	10M	CO3	BT2
OR				
7	Derive the expression for force exerted by a jet on stationary curved plate, if jet strikes the curved plate at the Centre and at one end.	10M	CO3	BT3
8	a) A Pelton wheel is to be designed for a head of 60 m when running at 200 rpm. The Pelton wheel develops 95 kW shaft power. The velocity of the buckets is 0.5 times the velocity of jet, overall efficiency= 0.85 and co-efficient of velocity= 0.98. b) Write about classification of turbines.	6M 4M	CO4	BT3
OR				
9	a) Describe the layouts and working of a hydropower layout. b) What are the characteristics curves of a hydraulic turbine? How are they useful to a practical engineer?	6M 4M	CO4	BT3
10	With a neat sketch, explain the principle and working of a centrifugal pump. Also indicate the different types of head losses which may occur in a pump installation.	10M	CO4	BT3
OR				
11	A double-acting reciprocating pump, running at 45 rpm, is discharging 0.009 m ³ /s of water. The pump has a stroke of 40 cm. The diameter of the piston is 20 cm. The suction and delivery heads are 3 m and 14 m, respectively. Find the slip of the pump and power required to drive the pump. Neglect the effect of piston rod area.	10M	CO4	BT2