R20 Regulation *Subject code: 3P4AD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, June 2026

HYDRAULICS & HYDRAULICS MACHINES

(CE)

Maximum Marks: 70 Date: 15.06.2026 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 hydraulic jump?	2M	1	L1
2	Write the rapid varied flow and gradually varied flow.	2M	1	L1
3	State Reyleigh's method of dimensional analysis.	2M	2	L1
4	Define the terms model, prototype, model analysis and hydraulic similitude.	2M	2	L1
5	Define the impact of jets and jet propulsion.	2M	3	L1
6	Write the expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.	2M	3	L1
7	Define specific speed of turbines.	2M	4	L1
8	What is NPSH?	2M	4	L1
9	What is negative slip in reciprocating pump?	2M	5	L1
10	Define load factor and capacity factor.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Find the discharge through a trapezoidal channel of width 6m and side slope of 1 horizontal to 3 vertical. The depth of flow of water is 3m and chez's constant, C=60.The slope of the bed of the channel is given 1 in 5000.	10M	1	L2
	OR			
12	A sluice gate discharges water into a horizontal rectangular channel with a velocity of 8m/s and depth of flow is 0.5m. The width of the channel is 6m. Determine whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water. Also determine the horse power lost in the hydraulic jump.	10M	1	L2
13	a) State Buckingham's π theorem. What do you mean by repeating variables? How are the repeating variables selected in dimensional analysis? b) The efficiency η of a fan depends on the density ρ, the dynamic viscosity μ of the fluid, the angular velocity ω, diameter D of the rotor and the discharge Q. Express η in terms of dimensionless parameters.	5M 5M	2	L2
	OR			

14	What is the significance of the non-dimensional numbers: Reynolds number, Froude number and Mach number in the theory of similarity? What is the dimensional analysis? How is this analysis related to the theory of similarity?	10M	2	L2
15	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 300 r.p.m. The jet makes an angle of 30^0 with the tangent to wheel at inlet and leaves the wheel with a velocity 4m/s at an angle of 120^0 to the tangent to the wheel at outlet, water is flowing from outward in a radial direction. The outer and inner radii of wheel are 0.6m and 0.3m respectively. Determine a) Vane angles at inlet and outlet b) work done per second per kg of water and c) efficiency of wheel.	10M	3	L2
	OR			
16	a) Find an expression for the efficiency of a series of moving curved vanes when a jet of water strikes the vanes at one of its tips. Prove that maximum efficiency is when u=v and value of maximum efficiency is 50% b) Show that for a curved radial vane, the work done per second is given by $\dot{p}aV1[V_{w1}u_1 \pm V_{w2}u_2]$	5M 5M	3	L2
17	Define the term unit power , unit speed and unit discharge with reference to a hydraulic turbine and also derive the expression for these terms.	10M	4	L2
	OR			
18	a) Design a Pelton wheel which is required to develop 1500 KW, when working under a head of 160 m at a speed of 420 rpm. The overall efficiency may be taken as 85% and assume other data required. b) Explain the principle on which Kaplan turbine works with a neat sketch.	5M 5M	4	L2
19	The diameter of an impeller of a centrifugal pump at inlet and outlet are 300 mm and 600 mm respectively. The velocity of flow at outlet is 2.5 m/sec and vanes are set back at an angle of 45 degrees at outlet. Determine the minimum starting speed of the pump if the manometer efficiency is 75%.	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