Regulation R17 *Subject code: 1P4AB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Year II Semester Supplementary Examinations, September 2023

FLUID MECHANICS-II

(CE)

Maximum Marks: 70 Date:15.09.2023 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)

1 What is meant by most economical section in open channel flow?
2 Explain the term specific energy of flowing fluid
3 What are geometric, kinematic and dynamic similarities?
4 Explain the terms: distorted and undistorted models.what is the use of distorted models?
5 State the principle of Angular momentum.
6 What is jet propulsion?
7 What is cavitation? Write the formula for cavitation in turbines.
8 Write about surge tank in turbines.
9 What is priming? Why is it necessary?
10 Differentiate between single stage and multi stage pump.

Part-B

Answer All the following questions. (10M X 5=50Marks)

11 An open channel of most economical section, having the form of a half hexagon with horizontal bottom is required to give a maximum discharge of $20.2m^3/sec$ of water. The slope of the channel bottom is 1 in 2500. Take chezy's constant, C=60 in chezy's equation, determine the dimensions of the cross-section, assume n=2/3. 10

OR

12 a) Derive expression for kinetic energy correction factor. 5
b) Velocity distribution in an open rectangular channel is given by $V=3y^{1/2}$. If the width of the channel is 10m and depth of flow is 1m. find the average velocity of the cross section, energy correction factor and momentum correction factor. 5

13 a) State the Buckingham's π- theorem. What do you mean by repeating variables? How are the repeating variables selected in dimensional analysis? 5
b) A pipe of diameter 1.5m is required to transport an oil of specific gravity 0.90 and viscosity $3x10^{-2}$ Poise at the rate of 3000 lt/s. Tests were conducted on a 15 cm diameter pipe using water at 20^o C. Find the velocity and rate of flow in the model. Viscosity of water at 20^o C= 0.01 poise. 5

OR

14 A ship of 250m long moves in a sea water, whose density is 1030kg/m^3. A 1:125 model of this strap is to be tested in wind tunnel. The velocity of air in the tunnel around the model is 20m/s and the resistance of the model is 50N. Determine the velocity of ship in sea water and also the resistance of the ship in sea water. The density of the air is given as 1.24kg/m^3. Take the kinematic viscosity as 0.012 stokes. And 0.018 stokes. 10

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. 10

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% 5

b) Show that for a curved radial vane, the work done per second is given by

$$\rho aV1[V_{w1}u_1 \pm V_{w2}u_2]$$ 5

17 a) what is meant by the speed ratio of a pelton wheel? 3

b) What is draft-tube? What are its functions? 3

c) Differentiate between an inward and outward flow reaction turbine. 4

OR

18 Water under a head of 300m is available for a hydel-plant situated at a distance of 2.35km from the source. The frictional loss of energy for transporting water is equivalent to 26(J/N).A number of pelton wheels are to be installed generating a total output of 18MW. Determine the number of units to be installed diameter of pelton wheel and the jet diameter when the following are available: wheel speed 650 r.p.m ; ratio of bucket to jet speed 0.46; specific speed not to exceed 30(m,kW,r.p.m.); C_v and C_d for the nozzle 0.97 and 0.94 respectively and the overall efficiency of the wheel 87%. 10

19 A centrifugal pump rotating at 1000rpm delivers 160 lit/sec of water against a head of 30m. The pump is installed at a place where atmospheric pressure is $1x10^5$ KPa. and vapour pressure of water is 3 KPa. The head loss in suction pipe is equivalent to 0.2m of water. Calculate: 10

i) Maximum NPSH and

ii) Maximum allowable height of the pump from free surface of water in the sump.

OR

20 a) Discuss detail estimation of hydro power plant. 3

b) What are the various applications of Hydroelectric power plant? 4

c) Define the terms load factor, utilization factor and capacity factor. 3