



Regulation R17
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: IP4AB

B.Tech II Year II Semester Supplementary Examinations, July 2022
FLUID MECHANICS-II

(CE)

Maximum Marks: 70

Date: 22.07.2022 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 Differentiate between subcritical flow and supercritical flow.
- 2 Define chezy's and manning's formula for uniform flow.
- 3 What do you meant by dimensionless numbers? Name any four dimensionless numbers?
- 4 State Buckingham's pi theorem.
- 5 Explain Hydraulic efficiency, Mechanical efficiency and Overall efficiency.
- 6 State the principle of Angular momentum.
- 7 What is a draft tube? What are its functions?
- 8 How will you classify the turbines?
- 9 Differentiate between volute casing and vortex casing for the centrifugal pump.
- 10 Define slip, percentage slip and negative slip of reciprocating 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 20.2 m³/s of water. The slope of the channel bottom is 1 in 2500. Taking Chezy's constant, C=60 in Chezy's equation, determine the dimensions of the cross-section. 10

OR

- 12 Define hydraulic jump. Explain various types of hydraulic jump. Derive the head loss in hydraulic jump. 10
- 13 The variables controlling the motion of a floating vessel through water are the drag force F, the speed V, the length L, the density ρ and dynamic viscosity μ of water and acceleration due to gravity g. Derive an expression for F by dimensional analysis. 10

OR

- 14 a. Write short notes on model and prototype. 4
- b. A 1:20 model of a flying boat is towed through water. The prototype is moving in sea water of density 1024 kg/m³ at a velocity of 15 m/s. Find the corresponding speed of the model. Also determine the resistance due to waves on model, if the resistance due to waves of prototype is 500 N. 6

- 15 Show that the force exerted by a jet of water on an inclined fixed plate in the direction of the jet is given by $F_x = \rho a V^2 \sin^2 \theta$, where a = Area of the jet, V = velocity of the jet and θ = inclination of the plate with the jet. 10

OR

- 16 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° with the tangent to wheel at inlet and leaves the wheel with a velocity 4m/s at an angle of 120° 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 10
- Vane angles at inlet and outlet
 - work done per second per kg of water and
 - efficiency of wheel.

- 17
- What are the characteristics curves of a hydraulic turbine? How are they useful to a practical engineer? 5
 - A turbine develops 7355 kW under a head of 24.7 m at 210 rpm. What is its specific speed? Indicate the type of turbine suitable for this purpose. If this turbine is tested in the laboratory where the head of water available is only 7.5 m, what power will it develop at what speed? 5

OR

- 18
- Define the term unit power, unit speed and unit discharge with reference to a hydraulic turbine. And also derive the expression for these terms. 5
 - 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. 5
- 19
- What are the various applications of Hydroelectric power plant 5
 - A centrifugal pump rotating at 1000 rpm delivers 160 liters/s of water against a head of 30 m. The pump is installed at a place where atmospheric pressure is 1×10^5 Pa(abs.) and vapour pressure of water is 2 kPa (abs.). The head loss in suction pipe is equivalent to 0.2 m of water. Calculate minimum NPSH. 5

OR

- 20 Define cavitation. What are the effects of cavitation? Give the necessary precaution against the cavitation. 5