



R17 Regulation

Subject code: 1P4CB

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

B.Tech II Year II Semester Supplementary Examinations, July 2021

FLUID MECHANICS AND HYDRAULIC MACHINES
(Mechanical Engineering)

Maximum Marks: 70

Date: 19.07.2021 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 which carries 10M.
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 How does the dynamic viscosity of liquid and gases vary with temperature?
- 2 What is surface tension of a fluid
- 3 What is minor loss in pipe flow?
- 4 State different types of forces present in fluid flow
- 5 Define boundary layer separation.
- 6 What is an orifice
- 7 Draw inlet and outlet velocity triangles for a Pelton wheel.
- 8 Explain overall efficiency of a turbine with formula
- 9 List the main parts of centrifugal pumps
- 10 Define cavitation and water hammer?

Part-B

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

- 11 a) Explain the phenomenon of surface tension on the top surface of liquids. What are the examples of surface tension. (5M)
b) Describe the differential manometer with neat sketch. (5M)

OR

- 12 The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of sp.gr. 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm. (10M)
- 13 a) Explain (i) Stream line (ii) vorticity (iii) Irrotational Flow (iv) Streak line. (10M)

OR

- 14 A pipe line carrying oil of specific gravity 0.87 changes in diameter from 200 mm at a position A to 500 mm at another position B which is 4 m at a higher level. If the pressures at A & B are 1 bar and 0.6 bar respectively and the discharge is $0.2 \text{ m}^3/\text{s}$, determine the loss of flow and direction of the flow. (10M)
- 15 a) What is the physical significance of displacement thickness of boundary layer theory? (5M)
b) Write about dimensionless numbers? (5M)

OR

- 16 Find the displacement thickness, momentum thickness, and energy thickness for the velocity

distribution in the boundary layer given by $\frac{u}{U} = \frac{y}{\delta}$ where u the velocity at a distance y from the plate and $u = U$ at $y = \delta$ where δ = boundary layer thickness. Also evaluate thickness of δ^*/θ . (10M)

- 17 A reaction turbine works at 450 r.p.m under a head of 120 m. Its diameter at inlet is 120 cm and the flow area is 0.4 m^2 . The angles made by absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. Determine (a) the volume flow rate (b) the power developed and (c) hydraulic efficiency assume whirl at outlet to be zero. (10M)

OR

- 18 What is a draft tube? Explain the uses and different types of draft tubes with neat sketches. (10M)
19 Differentiate between: (i) The impulse and reaction turbines, (ii) Radial and axial flow turbines and (iii) Kaplan and propeller turbines. (10M)

OR

- 20 Define a centrifugal pump. Explain the working of a single-stage centrifugal pump with sketches. (10M)