



R20 Regulation
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)
B.Tech III Semester Regular Examinations, February 2022

Subject code: 3P3AE

FLUID MECHANICS
(Civil Engineering)

Maximum Marks: 70

Date: 25.02.2022 Duration: 3 hours

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 State Newton's law of viscosity.
- 2 Define atmospheric pressure and vacuum pressure.
- 3 List the characteristics of laminar flow.
- 4 Compare rotational and irrotational flow.
- 5 What are the limitations of Bernoulli's equation?
- 6 Compare venturimeter and orifice meter.
- 7 List the various minor losses in flow through a pipe.
- 8 Define the term Hydraulic gradient line.
- 9 Mention the range of Reynold's number for laminar and turbulent flow in a pipe.
- 10 What are lift and drag forces?

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 Two plates are placed at a distance of 0.15 mm apart. The lower plate is fixed while the upper plate having surface area 1 m^2 is pulled at 0.3 m/s. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity 1.5 poise. 10M
- OR
- 12 (a) Calculate the density, specific weight and weight one litre of petrol of specific gravity 0.68. 5M
(b) Explain working of a differential manometer. 5M
- 13 (a) Differentiate between i) steady and unsteady flows ii) uniform and non-uniform flows 5M
(b) What is equipotential line and line of constant stream function? 5M
- OR
- 14 For a two-dimensional flow, the velocity potential is given by $\phi = x(3y-1)$. Determine the velocity at the point P (5, 6) and also find the value of stream function ψ at the point P. 10M
- 15 A 20 cm $\times$ 10 cm venturimeter is inserted in a vertical pipe carrying oil of sp.gravity 0.8, the flow of oil is in upward direction. The difference of levels between the throat and inlet section is 50 cm. the oil mercury differential manometer gives a reading of 30 cm of mercury. Find the discharge of oil. Neglect losses. 10M

OR

- 16 Compare broad crested weir and narrow crested weir. Derive an expression for maximum discharge over a broad crested weir. 10M
- 17 A horizontal pipe of 400 mm diameter is suddenly contracted to a diameter of 200 mm. the pressure intensities in the larger and the smaller pipe is given as 14.7 N/cm² and 11.7 N/cm² respectively. Find the loss of head due to contraction, if $C_c = 0.62$, Also determine the rate of flow of water 10M
- OR
- 18 Derive the Hagen-Poiseuille equation. 10M
- 19 (a) What is boundary layer separation? Discuss the effect of pressure gradient on boundary layer separation. 7M
- (b) What are the characteristics of boundary layer? 3M
- OR
- 20 Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $u/V = y/\delta$, where u is the velocity at a distance y from the plate and $u = U$ and $y = \delta$, where δ boundary layer thickness. Also calculate the value of δ^*/θ . 10M