R18 Regulation ***Subject code:*** 2P3AD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Regular/Supplementary Examinations, February 2021

Fluid Mechanics

(Civil Engineering)

Maximum Marks: 70 Date: 24.02.2021 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 viscosity of fluids vary with temperature?
2. State the hydrostatic law.
3. Write the significance of Reynold's number.
4. What is velocity potential function?
5. State Bernoulli theorem.
6. Name some flow measuring devices.
7. What is an equivalent pipe?
8. Compare HGL and TEL with sketches.
9. What is boundary layer separation? When does it occur?
10. Compare drag and lift.

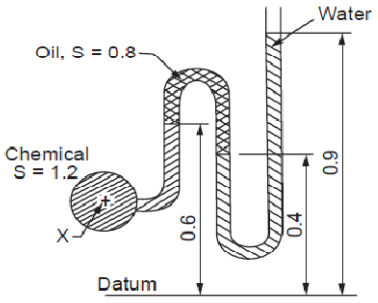
Part-B

Answer All the following questions. **(5 x 10 = 50 marks)**

11. (a) Define specific gravity, surface tension and vapour pressure. (3M)
    (b) State Newton's law of Viscosity and give its applications with Newtonian and non-Newtonian fluids. (7M)

(OR)

12. (a) Determine the pressure at point '***X'***for the situation shown in Figure. The lengths are indicated in meter. (6M)



(b) Sketch a Bourdon's pressure gauge and mark its parts. (4M)

13. (a)Distinguish between (i) steady flow and un-steady flow (ii) uniform and non-uniform flow and (iii) compressible and incompressible flow. (6M)

    (b) Given velocity component u = c*x*, *v* = – c*y*. Does it satisfy continuity equation? (4M)

(OR)

14. Check whether the following velocity relations satisfy the requirements for a steady irrotational flow. (i) $u = x + y$, $v = x - y$ (ii) $u = xt^2 + 2y$, $v = x^2 - yt^2$
    (iii) $u = xt^2$, $v = xyt + y^2$. (10M)

15. Derive Bernoulli equation from the Euler's equation of motion.State its limitations. (10M)

(OR)

16. A horizontal Venturimeter with inlet diameter 200 mm and throat diameter 100 mm is employed to measure the flow of water. The reading of differential manometer connected to the inlet is 180 mm of mercury. If Cd =0.98, determine the rate of flow. (10M)

17. (a) Derive Darcy equation to indicate loss of head due to friction in flow through pipes. (6M)
    (b) The velocity of water in a pipe of diameter 200 mm is 5 m/s. The length of pipe is 50 m. Find the loss of head due to friction, if f= 0.08. (4M)

(OR)

18. Three pipes of 400mm, 200 mm and 300 mm diameters have length of 400m, 200m and 300m respectively. They are connected in series to make a compound pipe. The ends of this compound pipe are connected with two tanks, whose difference in water level is 16m. If the co-efficient of friction for these pipes is same and is equal to 0.005, determine the discharge through the compound pipe, neglecting first the minor loses and then including them. (10M)

19. (a) Discuss Magnus effect with an example. (4M)
    (b) A thin plate (length- 55 cm and width- 35 cm) is moving in still atmosphere at velocity of 4.8m/s. Find the following (i) thickness of boundary layer at the end of plate (ii) drag force on one side of plate.
    Assume the density of air as 1.25 kg/m^3 and kinematic viscosity as 0.16 stokes.(6M)

(OR)

20. (a) Describe the characteristics of boundary layer with reference to flow over a flat plate.(6M)
    (b) Describe laminar sub layer and point of separation. (4M)