Code No: RT21016 **R13** SET - 1

II B. Tech I Semester Supplementary Examinations, October/November - 2019
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Determine the pressure at a depth of 4 m below the free surface of an oil of specific gravity 0.75.
   b) Find whether the velocity Ø= -4xy describes a case of incompressible flow.
   c) Why the Bernoulli's equation is called Bernoulli's energy equation even though, all the terms are related to head.
   d) Draw the details of a cambered air foil.
   e) What is the effect of the error in head measurement on discharge of a weir?
   f) Explain the use of moody's diagram. (4M+4M+4M+3M+3M+4M)

PART-B

2. Determine the power required to run a 300 mm dia shaft at 400 rpm in journals with uniform oil thickness of 1 mm. Two bearings of 300 mm width are used to support the shaft. The dynamic viscosity of oil is 0.03 Pas. (16M)

3. a) Water flows at the rate of 400 lit/s through the pipe with inlet (1) diameter of 35 cm and (2) outlet diameter of 30 cm with 4m level difference with point 1 above point 2. If P_1= P_2=2 bar absolute, determine the direction of flow.
   b) A pipeline is set up to draw water from a reservoir. The pipe line has to go over a barrier which is above the water level. The outlet is 8 m below water level. Determine the maximum height of the barrier if the pressure at this point should not fall below 1.0 m of water to avoid cavitation. Atmospheric pressure is 10.3 m of water. (8M+8M)

4. Velocity distribution for laminar flow of real fluid in a pipe is given as $\upsilon=V_{max}[1-(r^2/R^2)]$, where V_{max} is velocity at the centre of the pipe, R is pipe radius, and υ is velocity at radius r from the centre of the pipe. Determine the momentum correction facto (16M)

5. If a laminar boundary layer at zero pressure gradient over a flat plate is described by the velocity profile $\frac{\upsilon}{V_0} = \frac{3}{2}\eta - \frac{\eta^3}{2}$ In which $\eta=(y/\delta)$, show that boundary layer thickness δ, wall shear stress τ_0 and coefficient of drag C_D are given by $d = \frac{4.65x}{\sqrt{Re_x}}$; $t_0 = \frac{0.322\rho V_0^2}{\sqrt{Re_x}}$; $c_D = \frac{1.328}{\sqrt{Re_L}}$ (16M)

6. Two reservoirs with 15 m difference in their water levels are connected by a 300 mm diameter pipe line of 3000 m length. Calculate the discharge. If a parallel pipe line of 300mm diameter is attached to the last 1500 m length of existing pipe, determine the modified discharge. Take only wall friction into account. Assume f=0.04 in Darcy's-Weisbach formula. (16M)

7. A venturimeter has its axis vertical, the inlet and throat diameter being 150 mm and 75 mm respectively. The throat is 225 mm above inlet and K= 0.96. Petrol of specific gravity 0.78 flows up through the meter at a rate of 0.029 m^3/s. Find the pressure difference between the inlet and the throat. (16M)
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