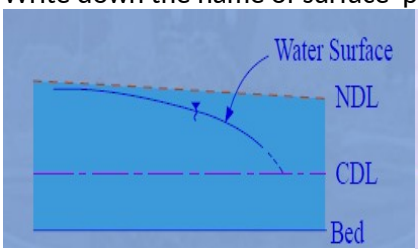
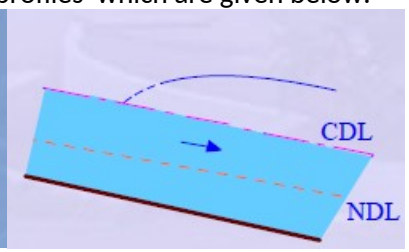
UNIVERSITY OF PETROLEUM & ENERGY STUDIES
DEHRADUN
End Term Examination –May, 2018

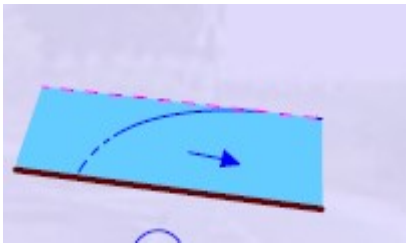
Name of the Program/course: B.Tech Civil Engg. **Semester – 4th**
Subject Name : Fluid Mechanics II **Max. Marks : 100**
Subject Code : CEEG222 **Duration : 3 Hrs**
This question paper has two page(s).
Note:- Attempt all questions from section A and B. Attempt any two questions from Section C.

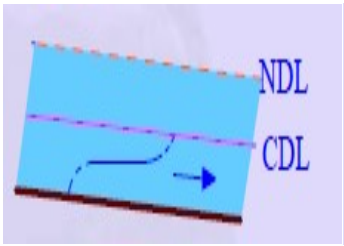
Section A

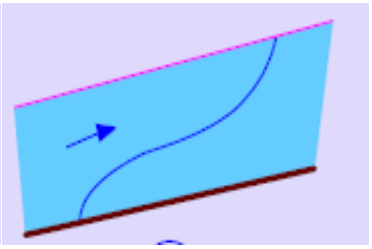
1. A golf player seeks your advice in regard to the advantage of using a rough ball over a new one which is relatively smooth. How would you explain to him that "Rougher the ball, faster it goes"? 5 (CO2)
2. What do you understand by magnus effect? 5(CO2)
3. What is the function of draft tube? 5(CO4)
4. Write down the name of surface profiles which are given below: 5 (CO3)











Section B(10x4)

5. A pipeline carrying water has a discharge of 0.5 m and is 2.0 km long. To increase the delivery another pipeline of the same diameter is introduced parallel to the first pipe in the second half of its length. Find the increase in discharge if the total head loss in both the cases is 15m. Assume f = 0.02 for all pipes. 10 (CO1)

or

Derive an expression for shear stress on the basis of Prandtl Mixing Length Theory. 10(CO1)

6. Air flows over a flat 1m long at a velocity of 6m/sec. Determine(a) the boundary layer thickness at the end of plate, (b) shear stress at the middle of plate (c) total drag per unit length on the sides of plate. Take $\rho = 1.226$ kg/m^3 and $\upsilon = 0.15 \times 10^{-4}$ m^2/sec for air. 3+3+4 (CO2)

7. A centrifugal pump impeller has an outer diameter of 30 cm and an inner diameter of 15 cm. The pump runs at 1200 rpm. The impeller vanes are set a blade angle of 30 degree at the outlet. If the velocity of flow constant at 2.0 m/sec, calculate
   I. The velocity and direction of outlet
   II. The head developed by assuming a manometric the efficiency of 0.85
   III. The blade angle at the inlet (4+3+3)(CO4)

8. At the toe of a hydraulic jump the Froude number and depth of flow are 10.0 m and 4.0 m respectively. Estimate the specific energy head at the heel of the jump. 5+5(CO3)

Section C(20x2)

9(a) A rectangular channel 9 m wide discharges water at normal depth 3.65m.The bed slope is 1in 4000 and Manning's coeff. n = 0.017. A dam placed downstream raises the level to a height of the profile to 6.8m immediately behind the dam. Determine the length of the profile by single step. 12(CO3)

9(b) Derive dynamic equation of Gradually Varied flow. 8(CO3)

10(a) The following data pertain to an inward flow reaction turbine

Net head	=	86.4 m
Speed of the runner	=	650 rpm
Shaft power available	=	397 kW
Ratio of wheel width o wheel diameter at inlet	=	0.10
Ratio of inner diameter to outer diameter	=	0.5
Hydraulic efficiency	=	95%
Overall efficiency	=	85%

Flow velocity is constant and discharge is radial. Neglect blockage of blades,
Find the dimensions and blade angles of the turbine. 14(CO4)

10(b) Discuss about for Pelton wheel. And draw neat sketch 4+2(CO4)

11 The water levels in the two reservoirs A and B are 104.5 m and 100 m respectively above the datum. A pipe joints each to a common point D, where pressure is 98.1 KN/m2 gauge and height is 83.5m above the datum. Another pipe connects D to another tank C. What will be the height of water level in C assuming the same value of f for all pipes. Take friction coefficient = 0.030. The diameters of the pipes AD, BD and CD are 300 mm, 450 mm, 600 mm respectively and their lengths are 240 m, 270m, 300m respectively. 20(CO1)