53 (CE 605) HDEN

2018

HYDRAULIC ENGG.

Paper : CE 605

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **All** questions.*

1. *(a)* Write down the definition of nominal boundary layer thickness, displacement thickness and momentum thickness.

   (b) Derive the mathematical expression for energy thickness in boundary layer region. 6+9=15

2. Water is flowing at critical depth at a section in a triangular shaped channel, with side slope 0·5H : 1V. If the critical depth is 1·6*m*, then estimate the discharge in the channel and specific energy at the critical depth section. 15

3. (a) What do you mean by Magnus effect?

(b) Write in details about Karman vortex trails in turbulent flow. 3+7=10

4. (a) Define and explain Newton's law of viscosity.

(b) A plate $0{\cdot}025mm$ distant from a fixed plate moves at $60cm/sec$ and requires a force of $2N$ per unit area to maintain this speed. Determine the fluid viscosity between the plates. 8+2=10

5. (a) Write down the properties of turbulent flow.

(b) What do you mean by Nikuradse's equivalent roughness?

(c) Write in details about hydraulically smooth and rough flow. 4+2+4=10

6. A cylinder $1{\cdot}2m$ in diameter is rotated about its axis in air having a velocity of $128km/hour$. A lift of $6000N$ per meter length of cylinder is developed on the body. Assuming ideal fluid theory, find the rotational speed and location of stagnation point. Given, $\rho = 1{\cdot}26kg/m^3$. 10

7. Write down in details on following : 6×5=30

(i) Terminal fall velocity

(ii) Boundary layer separation

(iii) Surge tank

(iv) Water hammer

(v) Derive differential equation for GVF.