Total No. of Questions : 8]

SEAT No. :

P9083

[Total No. of Pages : 4

[6179]-208

S.E. (Civil)

FLUID MECHANICS

(2019 Pattern) (Semester-III) (201003)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Answers to the all questions should be written in single answer-book.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator (non programmable) and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) a) Water is flowing through a pipe of diameter 30 cm at a velocity of 4.1 m/s. Find the velocity of oil flowing in another pipe of diameter 10 cm, if the condition of dynamic similarity is satisfied between two pipes. The viscosity of oil water and oil is given as 0.01 poise and 0.025 poise. Take specific gravity of oil = 0.8. **[5]**

b) Explain with neat sketch the phenomenon of "Boundary Layer Separation". **[6]**

c) Explain with neat sketch various methods to control 'Boundary Layer Separation". **[6]**

OR

Q2) a) Determine the dimensions of the following terms: **[5]**

i) Discharge

ii) Force

iii) Specific weight

iv) Kinematic viscosity

v) Dynamic viscosity

b) Explain the following with the help of neat sketch: **[6]**

i) Laminar boundary layer

ii) Turbulent boundary layer and

iii) Laminar sub-layer

c) Explain the Buckingham's π-method of dimensional analysis. **[6]**

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Q3) a) A pipe of 110 mm diameter is carrying water. If the velocities at the pipe centre and 30 mm from the pipe centre are 2.1 m/s and 1.6 m/s respectively and flow in the pipe is turbulent. Calculate the shear friction velocity and wall shearing stress. **[6]**

b) Explain in brief "Moody's Diagram" **[5]**

c) Three pipes of lengths 800m, 500m, and 400m and of diameter 500mm, 400mm, and 300 mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1750 m. Find the diameter of the single pipe. **[6]**

OR

Q4) a) A fluid of viscosity 8 poise and specific gravity 1.2 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is 212 N/m^2 . Find: **[6]**

i) The pressure gradient

ii) The average velocity and

iii) Reynolds number of the flow

b) Explain the procedure of Hardy Cross method for the analysis of pipe network. **[6]**

c) Explain in brief the following terms related with flow through pipes: **[5]**

i) Major losses and

ii) Minor losses

Q5) a) Define the following terms related with types of open channel flow: **[6]**

i) Steady flow

ii) Unsteady flow

iii) Uniform flow

iv) Non-uniform flow

v) Laminar flow

vi) Turbulent flow

b) Derive the conditions for most economical trapezoidal channel section. **[6]**

c) i) Find the specific energy of flowing water through a rectangular channel of width 5 m when the discharge of 10.1 m^3/s and depth of water is 3m. **[3]**

ii) Find the critical depth and critical velocity of the water flowing through a rectangular channel of width 5m, when discharge is 15.5 m^3/s. **[3]**

OR

Q6) a) A trapezoidal channel has side slope of 1 horizontal to 2 vertical and slope of its bed is 1 in 1500. The area of the section is $40m^2$. Find the dimensions for the channel sections if it is most economical as shown in Figure 6 a. Take Chezy' s constant as 80. **[6]**

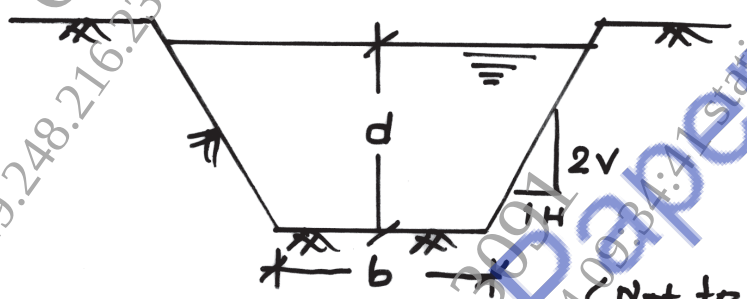

Figure 6(a)

b) Explain the Specific energy curve and Specific force diagram with neat sketch. **[6]**

c) Explain in brief: **[6]**

i) Classification of Channel

ii) Velocity distribution in open channel.

Q7) a) Experiments were conducted in wind tunnel with a wind speed of 50 km/ hour on flat plate of size 2m long and 1 m wide. The density of air is 1.16 kg/m^3. The coefficients of lift and drag are 0.76 and 0.16 respectively. Determine: **[6]**

i) the lift force

ii) the drag force

iii) the resultant force

iv) direction of resultant force and

v) power exerted by air on the plate

b) Explain Classification of channel bottom slopes with neat sketches. **[6]**

c) Explain with neat sketch:

i) Karman Vortex Trail **[3]**

ii) Polar Diagram **[3]**

OR

Q8) a) A rectangular channel is 20 m wide and carries a discharge of 65 m^3/s. It is laid at a slope of 0.0001. At a certain section along the channel length, the depth of flow is 2m.How far U/S or D/S will the depth be 2.6m? Take n=0.02. Use direct step method with two steps. Consider the depth increment in the interval of 0.1m.Classify and sketch the profile. **[10]**

b) Explain in brief: **[8]**

i) Magnus effect

ii) Types of drag

iii) Bluff body and

iv) Streamlined body

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