B. E. Sixth Semester (Civil Engineering) / SoE–2014-15 Examination

Course Code : CV 1310/CV 310/CV 608 **Course Name : Fluid Mechanics – II**

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions are compulsory.
(2) All question carry marks as indicated.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data wherever necessary.
(5) Illustrate your answers wherever necessary with the help of neat sketches.
(6) Use of non – programmable calculator is permitted.

1. (A) (i) Define Boundary layer theory, Momentum thickness, Energy thickness. 3

(ii) Oil of vicosity 0.2 Pa-s and Sp.gr. Of 0.8 flows through 150 mm diameter pipe. If the head loss in 2000 m, length pipe is 25 m, estimate

(a) Shear stress at the pipe wall

(b) Shear stress at a radial distance of 25 mm from the axis of the p

(c) Velocity at radial distance of 25 mm from the axis of the pipe,

(d) Check whether the flow is laminar. 4

OR

(B) (i) Derive an expression for shear stress distribution and velocity distribution for laminar flow in a circular pipe. 4

(ii) The fluid of viscosity 9 Ns/m² and specific gravity 1.0 is of flowing through a circular pipe of diameter 1.2 m. The maximum shear stress at the pipe wall is given as 220 N/m². Find the following;

(a) Pressure Gradiet

(b) Average velocity

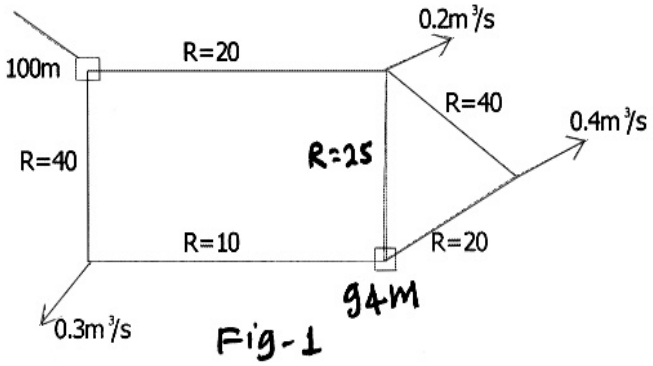
(c) Reynolds no. of the flow. 3

2. (A) (i) Enlist the various types of pipe losses with formulae and also derive the Dupuit's equation. 4

(ii) Define Hydraulic grade line and Energy grade line and also draw HGL AND TEL for Compound pipe (larger diameter pipe is followed by smaller diameter pipe). 4

OR

(B) Analyze loop network shown in fig.1,using Hardy Cross method. Use the head loss equation $hf = RQ^2$, Where R is the resistance constant of link and Q is the discharge in link in m^3/s. The available HGL at source and Resistance are shown in fig.1.(one iteration only).



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3. (A) (i) What do you understand by a most economical section of a channel ? Derive the condition of most economical section for a rectangular channel. 4

(ii) A trapezoidal channel carries a discharge of 3 m^3/s. If the bed slope is 1 in 4000 and side slope of the channel is 1 H : 0.5 V. Design the most economical section for this channel assume Manning's n = 0.02. 4

OR

(B) (i) Show that for most efficient triangular channel section, the hydraulic radius, R = Y/2.82 where y is the depth of flow. 4

(ii) A rectangular channel section 4 wide is laid at a slope of 0.0005. Calculate the normal depth of flow for a discharge of $8m^3$/sec in a channel. Take manning's constsnt as 0.02. 4

4. (A) (i) Draw and explain specific energy diagram for a given discharge. 3

(ii) A rectangular open channel has the following details :

Discharge = 16 m^3/s

Bed width = 10 m

Depth of water = 1.0 mts.

Determine :

(1) Specific energy

(2) Critical depth

(3) Critical velocity

(4) Minimum specific energy required for this discharge. 4

OR

(B) (i) What do you mean by hudraulic jump and state it types. 3

(ii) A rectangualar channel 5 m wide carries a discharge of 15 m^3/s at a velocity of 10 m/s. If hydraulic jump occurs, determine

(1) Depeth of flow after the jump

(2) Energy loss in the jump

(3) Height of the jump.

(4) Power loss in jump. 4

5. Solve Any **Three** of the following

(A) Derive the basic differential equation for G.V.F. in the form given below,

$$\frac{dy}{dx} = \frac{S_0 - S_t}{1 - F_{r1}^2}$$

and State the basic assumptions made in the derivation.

(B) For Mild and steep slope draw all the possible types of water surface profiles, with charecterstic conditions. 5

(C) A channel of rectangular section of 12 m wide convey water at a normal depth of 2.0 m, the bed slope 1 in 1800, due to an obstruction in the form of overflow dam, the water level near obstruction rises by 1 m. Find the slope of water surface near the obstruction with respect to horizontal. Take Manning's n = 0.025. 5

(d) A rectangular channel 2 m wide carries a discharge at a rate of 2.5 m^3/s. The bed slope of fluid is 0.0004, at certain section the depth is 1.0 m Calculate the distance of the section upstream or downstream where the depth of flow is 0.8 m. Assume Manning's constant as 0.014. Solve by direct step metho (consider 2 step). 5

6. Solve Any **Three** of the followng :

(A) Explain similitude and types of similarity. 5

(B) A 1:50 spillway model has a discharge of 125 m^3/s. What is the corresponding prototype discharge ? If a flood phenomenon takes 10 hours to occur in prototype how long should it take in the model ? 5

(C) Explain Distorted and undistorted model. 5

(D) A river model is constructed to a horizontal scale 1:1000 and vertical scale 1:75 in the prototype following observation were taken;

Discharge(Q) = 4000 m^3/s

Velocity of flow = 3 m/s

Bed slope = 1 in 1200

Find the corresponding values in model. 5