VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

[Central Technological Institute, Maharashtra State]

Matunga, Mumbai-400 019

SEMESTER EXAMINATION	*April-May 2012*	DATE OF EXAM	*21st May 2012*
SEMESTER & PROGRAM	*IV S.Y. B. Tech.(Civil)*	TIME	*1.30 pm to 4.30 pm*
TIME ALLOWED	*3 HRS.*	MARKS	*100*
COURSE (Course Code) :	*Applied Hydraulics (CE0005)*		

Instructions
1. All questions carry equal marks.
2. Figures to the right indicate full marks.

Q.1 (a) In case of GVF, which are the conditions for the slope of free water surface? (03)

(b) Define: TEL, HGL, Uniform flow, Non uniform flow . (04)

(c) Draw specific energy curve showing all the details. (04)

(d) An earthen channel with a base width of 2 m and side slope of 1H: 2V carries water with a depth of 1m.The bed slope is 1 in 625. Calculate the discharge if N=0.03. (03)

(e) Which are important dimensionless numbers? (02)

(f) A horizontal rectangular channel 4 m wide carries a discharge of 16 m^3/s. Determine loss of energy due to formation of hydraulic jump. An initial depth is 0.5 m before jump. (02)

(g) An oil of specific gravity 0.9 and viscosity 4 poise flows in a 5 cm dia horizontal pipe at the rate of 3.5 lit/s. Comment on type of flow. (02)

Q.2 Attempt **any TWO**.

(a) Find (i) displacement thickness (ii) momentum thickness (iii) energy thickness (iv) δ^*/θ for the velocity distribution in the boundary layer given by $u/U = 2(y/\delta) - (y/\delta)^2$ where u is the velocity at a distance y from the plate. (10)

(b) Discharge Q over rectangular weir depends on head over weir H, acceleration due to gravity g, length of the weir L, height of the weir crest above the channel bottom Z, density ρ, dynamic viscosity μ, of a liquid.. By dimensional analysis, find Q in terms of dimensionless parameters, making use of Buckingham's π theorem (10)

(c) Which are the required conditions for a trapezoidal channel section to be most economical? Derive them. (10)

Q.3 (a) For the following velocity profiles, determine whether the flow has separated or on verge of separation or will attach with the surface: (10)

(i) $u/U = (y/\delta) - 1/2\,(y/\delta)^2$

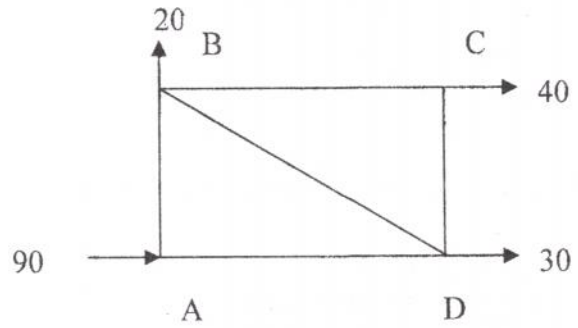
(ii) $u/U = (y/\delta)^2 - (y/\delta)^3 - 7/9(y/\delta)^4$

(iii) $u/U = -(y/\delta) - 5/7(y/\delta)^3$

(iv) $u/U = (y/\delta) - 3/5\,(y/\delta)^3 - 12/7(y/\delta)^4$

1/2 (P T O)

(b) Calculate the discharge in each pipe by Hardy Cross method (two trials) for the network shown in figure below. The pipe network consists of five pipes. The head loss h_f in a pipe is given by $h_f=kQ^n$ The value of k in equation $h_f=kQ^n$ is 1 for AB and CD, 2 for BC and AD and 3 for BD. n=2. (10)



Q.4 Attempt **any TWO**.

(a) A lawn sprinkler with two nozzles of dia 4 mm each is connected across a tap of water. The left and right nozzles are at a distance of 20 cm and 30 cm respectively from the tap. Both the nozzles discharge water in downward direction. The rate of flow in the tap is 120 cm^3 /s. Determine the angular speed at which the sprinkler will rotate freely. Also calculate the torque required to hold rotating arm stationary. (10)

(b) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of dia 300 mm, 200 mm and 400 mm respectively, is 12 m. Determine the rate of flow of water if coefficient of friction is 0.005 for all pipes. (1) Considering minor losses (2) neglecting minor losses. (10)

(c) (i)The water in a jet propelled boat is drawn amid-ship and discharged at the back with an absolute velocity of 30 m/s.The cross sectional area at the back is 0.03 sq.m and the boat is moving in a sea with a speed of 40Km/hr.Determine (1) propelling force on the boat (2) power required to drive the pump (3) efficiency of the jet propulsion. (05)

(ii) An oil of specific gravity 0.9 is flowing through a pipe of 200 mm dia at the rate of 60 lit/s. Coefficient of friction =0.005. Find (1) Reynold's number (2) head lost due to friction for 1 Km length of pipe (3) the power required to maintain this flow. (05)

Q.5 Write an explanatory note on: (20)

(a) Types of hydraulic jump.
(b) Surge tank.
(c) Types of similarity in case of model and prototype.
(d) Hydrodynamically smooth and rough boundaries.

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