EASTERN UNIVERSITY SRILANKA
FACULTY OF AGRICULTURE
THIRD YEAR FIRST SEMESTER EXAMINATION IN AGRICULTURE 2008/2009
(September/October 2009)
AEN 3101 - HYDRAULICS AND HYDROLOGY (2:30/00)

Time: 2 hrs
Answer all questions

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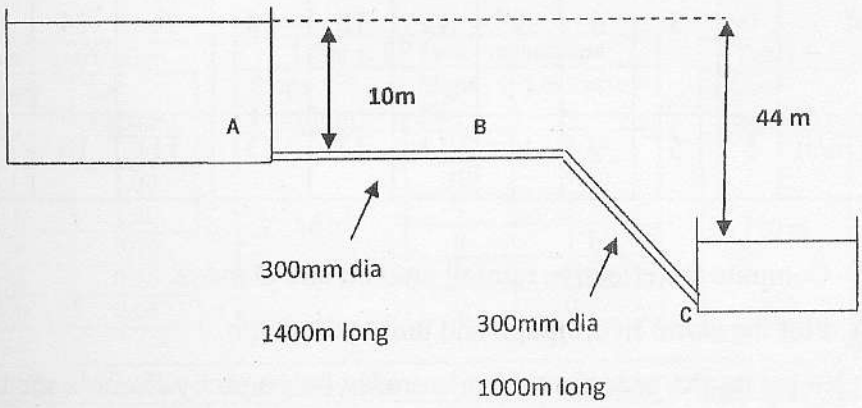
01. **(a)** Derive Bernoulli's equation for the flow of an incompressible frictionless fluid.

(b) A pipeline ABC connects two reservoirs as shown in the diagram. If the friction factor f is 0.008 determine the water flow rate and the pressure at B for the conditions shown. Neglect all energy degradation except that due to pipe friction.



02. **(a)** Using the Chezy formula, find the proportions of a trapezoidal channel which will make the discharge at maximum for a given area. Show that the sides and the base of such section are tangential to a semi circle whose centre is at the water surface.

(b) A trapezoidal channel of best section carries a discharge of 13.7m^3/s at a velocity of 0.9m/s. The side slopes are 1:2. (i) Design the channel if the Chezy's constant C= 45 and (ii) find the bed slope?

03. (a) Briefly explain the process and mechanics of infiltration with suitable illustrations.

(b) The infiltration rate under shallow ponding was monitored as a function of cumulative rainfall and found to be 20mm/hr when a total of 100mm had infiltrated. If the eventual steady rate of infiltration is 5mm/hr, estimate the infiltration rate at a cumulative infiltration of 200 and 400 mm. (Use the Green and Ampt equation)

04. Two rainfalls in magnitudes of 3.5 and 1.75 cm, occurring consecutively at 6-h interval on a catchment area of 75.168 Km^2. The out flow hydrograph of catchment is as follows. (Assume base is constant, at the rate of $5m^3/s$)

Time since beginning of rainfall (h)	0	3	6	9	12	15	18	21	24	27	30	33
Outflow(cu.m/s)	5	5	9	11	14	17	13	11	10	9	7	5

a) Compute the effective rainfall amount and Ø index.

b) Plot the storm hydrograph and unit hydrograph.

c) Separate the base flow from storm hydrograph by Barne's method also indicates the regions and important points on plotted hydrograph.

d) If 3-h unit hydrograph for a catchment area of $25km^2$ has $250m^3/s$ as peak discharge, determine the peak discharge of hydrograph, if base flow is $25m^3/s$. Assume direct runoff volume of catchment is $6.25x10^5m^3$.
