FACULTY OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING
SECOND SEMESTER EXAMINATION
(AUGUST 2018)
2017/2018 ACADEMIC SESSION

Course Title: HYDRAULICS

Course Code: CVE 302

HOD'S SIGNATURE

Instructions:

1) Answer any 5 questions in full. Draw neat sketches where necessary
2) **Time Allowed:** 2 1/2 **hours**
3) **SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAMINATION**

ELIZADE UNIVERSITY ILARA-MOKIN
Department of Civil and Environmental Engineering
B.Sc. (Civil Engineering) Degree Examination
Second Semester Examination 2017/2018 Session
Course Code: CVE 302 **Course Title: HYDRAULICS**
Time Allowed: 2 1/2 HOURS

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QUESTION 1 (20 marks).

(a) The Euler's equation, developed for the motion of steady flow of fluid is given by:

$$dp/d\rho + Vdv/g + dz + ahL_l = 0.$$

With the usual notations. Show how this was derived, and develop the Bernoulli's Equation for steady from the Euler's Equation (10 marks)

b) Water flowing a varying diameter pipe from A to B at the rate of $0.4\ m^3/s$ and the pressure head at A is $7m$. Considering the loss of energy from A to B. Find the pressure head at B. diameter of the pipe at A is $0.3m$, diameter at B is $0.6m$, elevation of the pipe at A is $10m$, while its elevation at B is $15m$. (10 marks)

QUESTION 2 (20 marks).

a. Water flows in a rectangular, concrete open channel (Manning's Coefficient n = 0.013). That is $12.0m$ wide at a depth of $2.5m$. The channel slope is 0.0025. Find the water velocity and the flow rate. (10 marks)

b. A corrugated metal pipe of 500mm diameter flow half-full at a slope of 0.0050. What is the flow rate for this condition? (10 marks)

QUESTION 3(20 marks).

Water is to flow at a rate of $30\ m^3/s$ in the concrete channel (n = 0.013) as shown the figure Q3. Find the required vertical drop of the channel bottom per kilometer of length (i.e the slope)

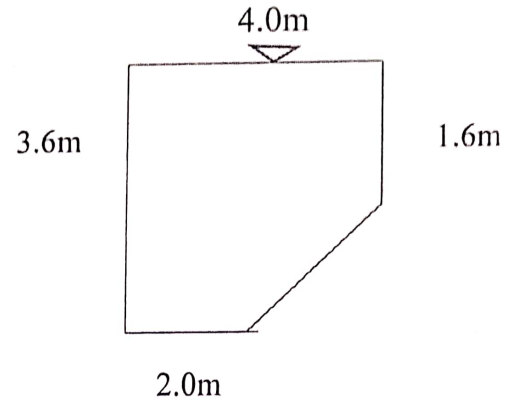

Figure Q3: Concrete channel

QUESTION 4 (20 marks).

A rectangular open channel 5.5m and 1,22m deep has aslope of 1 in 1000 and in lined with rubble masonry (Manning's n = 0.017). We wish to increase the amount water discharged as much as possible without changing the channel slope or the rectangular form of the section. The dimensions of the section may be changed but the amount of excavation must not be changed. Determine:

i. The discharge of the original channel
ii. New dimensions of a channel to give maximum discharge
iii. The ratio of the new discharge to the original discharge
iv. What is the new discharge?

(20 marks)

QUESTION 5 (20 marks).

a. Determine the best hydraulic section for a rectangular channel
b. An open channel is to be designed to carry 1.0 m^3/s at a slope of 0.0065. the channel material has n value of 0.011. find the most efficient cross-section for:
   i. A rectangular section.
   ii. A semi-circular section.

(20 marks)

QUESTION 6 (20 marks).

a. Develop the Reynolds model law for time and velocity ratios for incompressible fluids.
b. For a model and prototype, show that, when gravity and inertia are the only influences, the ratio of flows Q is equal to the ratio of the length dimension to 5/2 power. (20marks)