

TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY IN CONJUCTION WITH KENYA INSTITUTE OF HIGHWAYS AND BUILIDNG TECHNOLOGY (KIHBT)

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

HIGHER DIPLOMA IN BUILDING ECONOMICS

EBE 3117: HYDRAULICS I A

END OF SEMESTER EXAMINATIONS SERIES: OCTOBER 2016

TIME: 2HOURS

Instruction to candidates

You should have the following for this examination

- Answer booklet
- Pocket Calculator

This paper consist of five question. Answer any three questions of the five questions All question carry equal marks Maximum marks for each part of a question are as shown This paper consist of two printed pages

QUESTION 1

- a) A certain liquid has a mass of 1200 kg and a volume of 1.5 m³. Determine the following in SI units
 - i. Its unit weight
 - ii. Its mass density
 - iii. Its specific gravity
 - iv. The volume of 1600 N of the liquid

(Make any necessary assumption)

(9 marks)

b) State FOUR assumptions made deriving the Bernoulli's theorem

(4 marks)

c) Define the following terms

- i. Dimension
- ii. Unit of measurement
- iii. Pressure
- iv. Viscosity
- v. Ideal fluid
- vi. mass

(7 marks)

QUESTION 2

- a) Water flows through pipe AB, 1.2m in diameter at 3m/s and then passes through a pipe BC 1.5 m diameter. At C, the pipe branches into CD and CE. Branch CD is 0.8 m in diameter and carries one-third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Determine;
 - i. The discharge in AB
 - ii. The velocity in BC
 - iii. The velocity in CD
 - iv. The diameter of CE

(7marks)

- b) A 25 cm diameter pipe carries oil of specific gravity 0.9 at a velocity of 3 m/s. at another section the diameter is 20 cm. determine
 - i. The velocity at the 20 cm diameter section
 - ii. The mass flow rate of the oil
- (5 marks)

- c). For the syphon shown in fig q2c, determine;
 - i. The flow rate through the syphon
 - ii. The pressure at A (8 marks)



QUESTION 3

- a) .A 2000 m long pipe discharges water at a rate of 2001/s. The head lost due to friction is 4 m. if chezy's C=50 in SI units, determine the diameter of the pipe. (6marks)
- b) A 200 mm diameter pipe AB is 500 m long. The difference of pressure between the two ends of the pipe is 4 m of water. If Darcy's f=0.009, determine the discharge through the pipe

(4 marks)

c) Water is discharged from a reservoir into the atmosphere through a pipe 39 m long. There is a sharp entrance into the pipe and the diameter is 50 mm for the first 15 m from the entrance. The pipe then suddenly enlarges to 75 mm for the remainder of its length. Darcy's f=0.0048 for the 50 mm dia pipe and 0.0058 f0r the 75mm dia pipe. The discharge in the pipe is 2.81/s. Determine the difference in levels between the reservoir and the pipe outlet. (10marks)

QUESTION 4

- a) 16.5 m³/s is flowing through a trapezoidal channel with a water depth of 1.2 m. The channel has a base width of 9 m and side slopes of 2:1(V: H). if chezy's c=49.5, determine the bed slope of the channel.
 (6marks)
- b) For a circular pipe 1.8 m diameter, determine the depth for ;
 - i. maximum discharge
 - ii. maximum velocity (9 marks)

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c) Derive the expression for the best rectangular open channel proportions, using the usual notations.

QUESTION 5

(5 marks)

a).State THREE advantages of a V-notch over a rectangular weir. (3 marks)

b).A 60^{0} V-notch has a coefficient of discharge cd of 0.6. If the head causing flow is 0.3m, determine the discharge over the notch. (3 marks)

c).A cipolletti weir has a crest length of 2.0 m and a cd of 0.62. If the head causing flow is 1 m, determine the discharge. (3 marks)

d).A 36 m long weir is divided into 12 equal bays by vertical columns, each 0.6 m wide. Assuming that the velocity of approach is 2 m/s and the head causing flow is 1.2 m, determine the discharge over the weir considering both velocity of approach and end contractions. Use Francis formula (where cd=0.623). (9 marks)

c).Differentiate between a "suppressed weir" and a "drowned weir" (2 marks)