



UTHM

Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION SEMESTER I SESSION 2019/2020

COURSE NAME : HYDRAULICS & HYDROLOGY
COURSE CODE : BNP 20103
PROGRAMME : BNA / BNB / BNC
EXAMINATION DATE : DECEMBER 2019 / JANUARY
2020
DURATION : 3 HOURS
INSTRUCTION : ANSWER **FOUR (4)** QUESTIONS
ONLY.

TERBUKA

THIS QUESTION PAPER CONSISTS OF NINE (9) PAGES

- Q1 (a) Open channel flow conditions can be characterised with respect to space (uniform or non-uniform flow) and time criteria (steady or unsteady flows).
- (i) Explain each criteria of the open channel flow conditions.
(4 marks)
- (ii) Sketch each types of the flow condition.
(8 marks)
- (b) A $5.0 \text{ m}^3/\text{s}/\text{m}$ of water is flowing uniformly in a very wide channel having Manning's n of 0.014 and bed slope of 0.0002. Analyze the flow depth.
(5 marks)
- (c) A $8.73 \text{ m}^3/\text{s}$ of water must flow in an open channel with hydraulically best section having Chezy's C of $68 \text{ m}^{1/2}/\text{s}$ and bed slope of 0.0012. Design the channel if the shapes are:
- (i) Rectangular
(4 marks)
- (ii) trapezoidal with side slope of 60°
(4 marks)

TERBUKA

- Q2 (a) Hydraulic jump occurs when supercritical flow (at upstream) changes suddenly to subcritical flow (at downstream) within a short distance. Describe **TWO (2)** applications of hydraulic jump. (2 marks)
- (b) A $22.2 \text{ m}^3/\text{s}$ of water is flowing in a rectangular canal of 4m width. If the Manning's n is 0.020, give the value of:
- i) critical depth (3 marks)
 - ii) critical velocity (3 marks)
 - iii) critical bed slope. (3 marks)
- (c) A $9.8 \text{ m}^3/\text{s}$ of water is flowing uniformly in a very long rectangular open channel of 2.6 m width having Manning's n 0.016 and bed slope 0.02. The channel is to be constricted. Analyze the water depth at:
- i) the upstream, (4 marks)
 - ii) the downstream, (6 marks)
 - iii) the constriction, if the width of the constriction is 2.4 m. (4 marks)

TERBUKA

- Q3** (a) List **FOUR (4)** basic data required for hydrological studies (4 marks)
- (b) Explain briefly **FIVE (5)** practical applications of hydrology (5 marks)
- (c) A reservoir level after weeks of drought is falling at a rate of 5 mm/day with a surface area of 0.5 km². The average evaporation rate from the reservoir surface is 1.5 mm/day, the inlet discharge is 10,000 m³/day, and the outlet discharge is 13,000 m³/day. Assuming the only variables in the budget equation are inflow, groundwater, outflow, evaporation and rate change of storage. Determine the total net rate of groundwater discharge into the reservoir. Give your answer in meter. (6 marks)
- (d) A lake has an area of 25 km². In May 2017, total evaporation was 88 mm, average inflow to the lake was 2.2 m³/s, the average outflow from the lake was 1.5 m³/s, and the water level for the lake was observed to increase by 121 mm. Compute the precipitation (in mm) in May 2017. (10 marks)

TERBUKA

- Q4** (a) List **FOUR (4)** methods in determining infiltration. (4 marks)
- (b) Describe briefly **TWO (2)** types of precipitation. (5 marks)
- (c) The infiltration rate for small area was observed to be 4.5 in/hr at the beginning of the rain and it decreased exponentially to an equilibrium of 0.5 in/hr after 10 hrs. A total of 30 inches of water infiltrated during the 10 hr interval. Determine the value of k in Horton equation. (6 marks)
- (d) The following data in **Table Q4 (d)** are obtained from the current meter gauging ($v = 0.23N_s + 0.04$) of a stream. Compute the stream discharge by using the mean section method. (10 marks)

TERBUKA