A Centre of Excellence

TECHNICAL UNIVERSITY OF MOMBASA (TUM)

UNIVERSITRY REGULAR EXAMINATIONS FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 4504: WATER RESOURCES ENGINEERING I

END OF SEMESTER EXAMINATION
SERIES: 2024/2025
TIME: 2 HOURS

Instructions to Candidates:

1. You should have answer booklet for this examination.
2. This paper contains **FIVE** questions
3. Answer ALL questions.
4. Marks for each question are indicated in the parenthesis.
5. Examination duration is 2 **Hours**

ECV 4504: WATER RESOURCES ENGINEERING I

QUESTION ONE (20 MARKS)

(a) Explain five planning for storage scheme considerations used to optimize designs. (5 Marks).

(b) Explain all the forces acting on a gravity dam. You can use a well annotated sketch to explain. (5marks)

(c) Explain types of spillways as used in dams' construction. (5Marks).

(d) Explain sedimentation process and its effects in water engineering projects. (5Marks)

QUESTION TWO (20 MARKS)

(a) By use of a well annotated sketch explain the hydrological cycle. (5 Marks)

(b) Explain the occurrence and extraction process of underground water resources. (5 Marks)

(c) Explain the following terms as used in groundwater resources (6 Marks)

(i) Specific yield
(ii) Specific retention
(iii) Storage coefficient
(iv) Hydraulic conductivity
(v) Porosity
(vi) Transmissivity

(d) Explain water use systems that are designed to support habitation. (4 Marks)

QUESTION THREE (20 MARKS)

(a) Briefly explain how sediment transport takes place in waterways. (5 Marks)

(b) Explain significant features of ground water that should be considered while managing ground water resources. (5Marks).

(c) Compare and contrast well and canal irrigation. (5 Marks).

(d) Discuss ground water exploration. (5 Marks)

QUESTION FOUR (20 MARKS)

(a) Discuss the physical, economic and environmental considerations which influence the planning of a water resource project. (10 Marks)

(b) What are the main factors which affect the selection of a dam? (5 Marks).

(c) Using an illustration describe specific water levels and parts of a dam. (5 Marks)

QUESTION FIVE (20 MARKS)

(a) It is proposed to dam a 40-m wide stream such that the depth of water on the upstream side of the dam is 9 m. Estimate the maximum power that could be extracted by a turbine at this location. (10 Marks)

(b) A hydroelectric project is to be developed along a river where the 90-percentile flow rate is 2500m3/s and a ripple analysis indicates that storage to a height of 40 m above the downstream stage is required to meet all the demands. Estimate the installed capacity that would be appropriate for these conditions. (10 Marks) .

Pmax=bPmax=b(2/5)^5/2 *ρg^3/2*H_{eff}^5/2

P=$^{\gamma}$Qh$^{\eta}$ (take $^{\gamma}$=9.79 and $^{\eta}$=0.85)

$Q/Q_O=(H_2^{3/2}- H_1^{3/2})/H_o^{3/2}$