JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF SPATIAL PLANNING

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN WATER RESOURCE AND ENVIRONMENTAL MANAGEMENT

SEMESTER 2016/2017 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: PWE 3212

COURSE TITLE: WATER RESOURCE THECHNOLOGY I

EXAM VENUE: **STREAM: SPATIAL PLANNING**

DATE: **EXAM SESSION:**

TIME: 2 HOURS

Instructions:

1. **Answer question 1 (compulsory) and ANY other 2 questions.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE **[30 marks]**

(a) Discuss the different types of reservoirs and the purpose served by each type. **[8 marks]**

(b) Discuss the activities involved in engineering surveys for planning and investigation of reservoirs and dams. **[9 marks]**

(c) Discuss global overview of water resources. **[7 marks]**

(d) Table 1(d) gives the areas enclosed by contours at various elevations.

Table 1(d)

Contour [m]	Area [km^2]	Contour [m]	Area [km^2]
222	1.8	237	2362.5
225	22.4	240	3473.8
228	166.6	243	4000.5
231	258.3	246	4396.0
234	1526.9	249	4638.4

Taking 222 m as the bottom level of the reservoir and 249 m as the top level, compute the capacity of the reservoir by:

i. Trapezoidal formula. **[2 marks]**

ii. Prismoidal formula. **[2 marks]**

iii. Cone formula **[2 marks]**

QUESTION TWO **[20 marks]**

(a) Discuss effects of sedimentation on reservoir functions **[4 marks]**

(b) Discuss both pre- construction and post construction measures for controlling siltation in reservoirs. **[8 marks]**

The runoff from a catchment during the successive months is shown in Table 2(c). Determined by mass curve method the capacity of the reservoir required if the entire inflow of water is withdrawn at a uniform rate without any loss of water over the spillway. **[8 marks]**

Table 2(c)

Months	Runoff $x10^6 m^3$	Months	Runoff $x10^6 m^3$
January	1.8	July	20
February	2.5	August	24
March	3.2	September	3.5
April	9.0	October	2.8
May	12.5	November	2.2
June	13.0	December	1.8

QUESTION THREE **[20 marks]**

(a) With the aid of a sketch describe the construction features of a buttress dam. Outline its merits and demerits. **[7 marks]**

(b) With the aid of a sketch describe the construction features of an arch dam. Outline its merits and demerits. **[7 marks]**

(c) Discuss the factors considered when selecting a dam site. **[6 marks]**

QUESTION FOUR **[20 marks]**

(a) Explain the meaning of a spillway and why is it necessary in dam construction.**[4 marks]**

Figure 4(b) gives the profile of a gravity dam with reservoir level as shown. Determine the normal stresses at the toe and heel. Take unit weight of concrete as$23.5\ kN/m^3$ and C=1.

[10 marks]

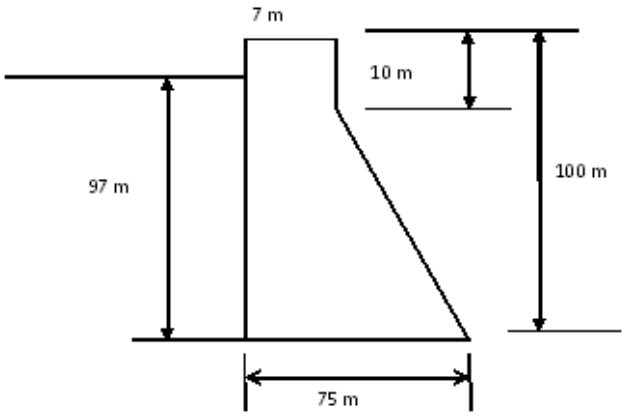

Figure 4(b)

(b) Describe the following types of earthen dams:

i. Homogeneous embankment **[3 marks]**

ii. Zoned embankment type **[3 marks]**

QUESTION FIVE **[20 marks]**

(a) Discuss the advantages and disadvantages of Hydro-Power System. **[5 marks]**

(b) With the help of a map show any four major hydropower generation plants in Kenya **[4 marks]**

(c) Give an account of environmental impacts of water power development projects. **[5 marks]**

(d) The construction costs for certain possible heights of a dam at a given site have been estimated and tabulated in Table 5(d). The storage capacities for all these dam heights are also given.

Table 5(d)

Height of dam in [m]	Constrction cost x 10^6 Ksh.	Storage x $10^6 m^3$
10	40	50
20	80	110
30	120	180
40	180	250
50	270	350
60	390	500
65	500	600

Determine the most economical height of the dam from purely construction point of view. **[6 marks]**