JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF SPATIAL PLANNING AND NATURAL RESOURCE MANAGEMENT

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

2ND YEAR 1ST SEMESTER 2013/2014 ACADEMIC YEAR

REGULAR

COURSE CODE: PWE 3212

COURSE TITLE: WATER RESOURCES TECHNOLOGY 1

EXAM VENUE: LR 6 **STREAM: (Water Sciences)**

DATE: 16/04/14 **EXAM SESSION: 9.00 – 11.00 AM**

TIME: 2.00 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

a) For purposes of solving water needs in a society, explain **two** functions of a water resource technologist/ engineer **(2 marks)**

b) Describe **Three** kinds of investigations usually conducted for reservoir planning **(6 marks)**

c) Define the terms Dead Storage and Safe Yield as used in reservoir engineering **(2 marks)**

d) Explain **four** factors that you would consider when selecting type of dam to construct? **(8 marks)**

e) Using energy equation, describe how gross energy head of water in motion contributes to Hydropower Production **(4 marks)**

f) Explain **four factors** that are applicable for purposes of classification of hydro-power plants **(8 marks)**

QUESTION TWO

a) Considering storage required for a uniform demand of a reservoir, sketch a mass inflow curve from a flow hydrograph for 5 consecutive years (1950 to 1944), and indicate possible positions/ sections:

i. Where the reservoir is considered full and empty
ii. That determines the demand capacity
iii. That determines the required storage **(8 marks)**

b) A reservoir has the following areas enclosed by contours at various elevations. Determine the capacity of the reservoir elevations of 300 to 400.

Elevation	300	320	340	360	380	400
Area of contours (Km^2)	180	205	230	320	400	460

By:

(i) Trapezoidal Rule **(12 marks)**

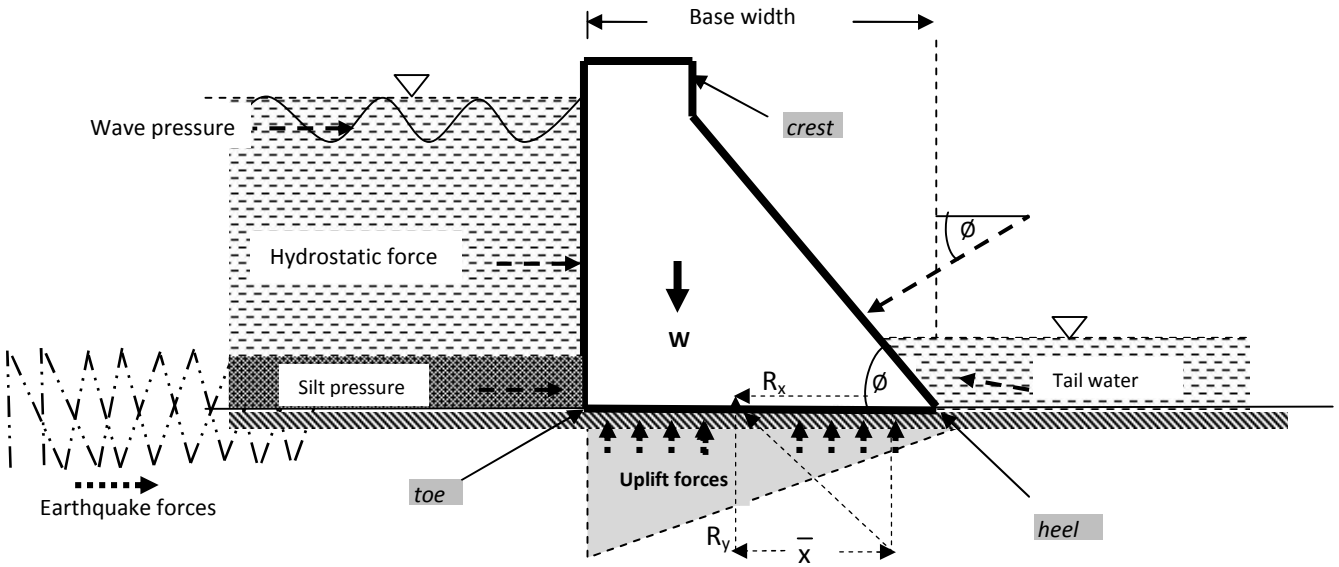
(ii) Prismoidal Rule

QUESTION THREE

a) Explain the **three** kinds of failures that would prompt you to conduct dam stability analysis

(6 marks)

b) A gravity dam might experience disturbances against the expected stability designed for it as illustrated in the diagram below. Cases of occurrence of such forces might reduce design life of the dam or might cause damage to it.



Required:

a) Describe the necessary procedure for dam stability analysis **(10 marks)**

b) How would you determine if the dam would be safe? **(4 marks)**

QUESTION FOUR

a) With reference to a reservoir and its catchment, explain **four** factors that Influence/ affect sedimentation and **four** methods that can be adopted to control reservoir siltation. **(8 marks)**

b) Yatta village has a drainage basin area of 40,000 m^2. The basin experiences an estimated suspended sediment discharge of 36,000 kg/year and a bed load discharge of 22,000 kg/year.

The estimated bed load density = 2500kg/m^3

The estimated soil density = 500kg/m^3

Calculate: (i) The Erosion rate and Unit Erosion Rate of the reservoir

(ii) The rate at which the bed-load would be lowered

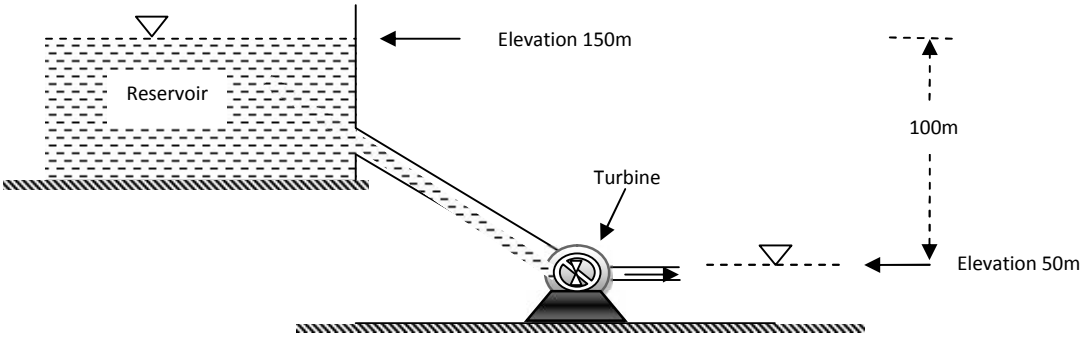
(iii) The Rate at which the soil will be lowered **(12 marks)**

QUESTION FIVE

a) Briefly explain the mechanism of hydropower production **(4 marks)**

b) Explain **six** components of hydroelectric power system **(6 marks)**

c) A hydrostatic power plant takes in $30m^3/s$ of water through its turbines and discharges it at v = 2m/s at atmospheric pressure. The Head loss in the turbine and conduit system is 20m.



i. Using Bernoulli's energy equation, determine the net energy head, H in meters

ii. Estimate the power, P, extracted by the turbine in Watts **(10 marks)**

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