WORKFORCE DEVELOPMENT AUTHORITY

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ADVANCED LEVEL NATIONAL EXAMINATIONS, 2016, TECHNICAL AND PROFESSIONAL STUDIES

EXAM TITLE: Hydraulic Structures

OPTION: Surveying (SUR)

DURATION: 3hours

INSTRUCTIONS:

The paper is composed of **three (3) main Sections** as follows:

Section I: Fourteen (14) compulsory questions.	**55 marks**
Section II: Attempt **any three (3)** out of five questions.	**30 marks**
Section III: Attempt **any one (1)** out of three questions.	**15 marks**

Note:

Every candidate is required to carefully comply with the above instructions. Penalty measures will be applied on their strict consideration.

**01.** Complete the sentences with the right statements.

    a) Uniform flow is said to occur when **1mark**

- size and shape of the cross-section in a particular length remain constant
- size and shape of the cross-section change along a length
- frictional loss in the particular length of the channel will be less than the drop in elevation.

    b) In Chezy's formula $V = C\sqrt{mi}$ **1mark**

- V is the mean velocity of flow
- m is the hydraulic mean depth
- i is the loss of head per unit length of pipe

    c) Hydraulic radius is equal to **1mark**

- area divided by the square of wetted perimeter
- area divided by wetted perimeter
- square root of the area.

    d) The instrument used for measuring the velocity of flow, is known as **1mark**

         ● Orifice meter   ● Pitot tube

    e) The upper surface of the weir over which water flows, is known as **1mark**

         ◆ vein   ◆ nappe   ◆ sill

02. What do you think are the advantages of using Gabions in construction?   **3marks**

03. Mention and explain five (5) types (on your choice) of hydraulic structures on the basis of function.   **5marks**

04. List the materials used to build bridges. What is the purpose of bridges construction?   **3marks**

05. Outline five (5) types of bridges.   **5marks**

06. Outline and explain three (3) factors influencing the runoff.   **6marks**

07. What is an open canal? Give the types of canals based on their shapes.   **5marks**

08. What is the most commonly used canal-cross section in drainage.   **1mark**

09. What are the main functions of a septic tank? **2marks**

10. Explain briefly a Catchment area. **3marks**

11. State five (5) factors you consider in selecting a site for rain gauge station.

5marks

12. List down the types of precipitation. **4marks**

13. Outline the materials used in constructing culverts. **3marks**

14. Give five (5) causes of errors which occur in rainfall measurement. **5marks**

Section II. Choose and answer any three (3) questions   **30marks**

15. Outline the dams according to the materials of which they are constructed and mention five (5) functions of a dam. **10marks**

16. If you have a catchment of 50 m wide and 20 m long.

    a. Estimate the quantity of rain water in m³ you can harvest under the rainfall of 300 mm/year. Consider the Runoff coefficient C= 0.8

    b. What do you think if you need to use 500 m³ for irrigation purposes?

10marks

17.   **(a)** List different materials used for gabions construction.

    (b) Give the names of tools used for:

        1) Levelling and setting out of a building

        2) Placing mortar

        3) Controlling the right angle when we set a structure

        4) Carrying materials

        5) Verifying verticality of a masonry work place **10marks**

18. State the Dalton's law of evaporation and explain the terms "hydraulic" and "Fluid". **10marks**

19. The average annual precipitation in a city is 926.9 mm. A person consumes 150L of water/ day including agriculture, industry, trade...). With a population of 53,390,300 in the region and an area of 58,368 km², what percentage % of precipitation is used by humans? **10marks**

20. Calculate the surface area of the cross section and the wetted cross-section of the canal shown below. Compare both section areas.

a=3.75m
a1=3.25m
h1=1m
h=1.25m
b=1.25m
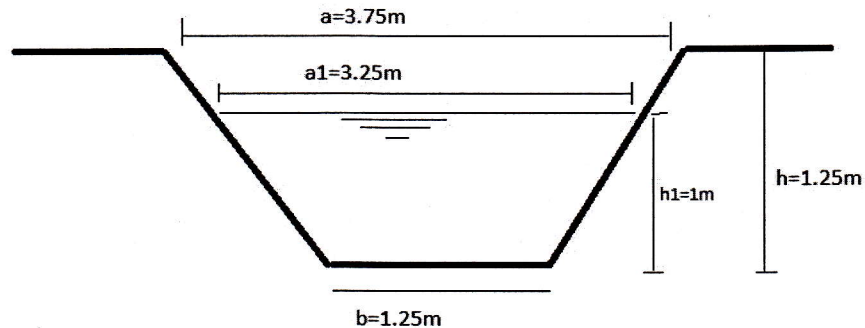
21. A rectangle concrete dam which has 2.5 m of width retains water up to 6m of its height. Find the total pressure per meter length of the wall and the point at which the resultant cuts the base. Also find the resultant thrust on the base of the wall per meter length. Assume weight of masonry as 23 KN/m^3.

2.5m
6 m
P
O
M
W
R
R
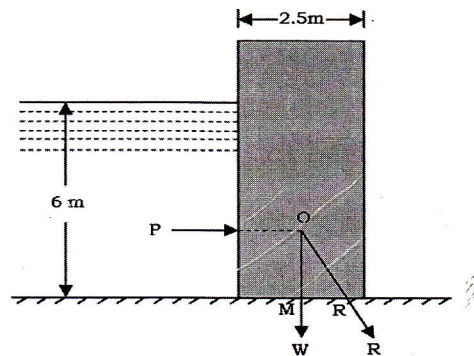
22. The classification of rain rates for different levels of activities are listed in table below:

Type of rain	Rate
Light rain	2-4 mm/hr
Moderate rain	5-9 mm/hr
Heavy rain	10-40 mm/hr
Violent rain	More than 50 mm/hr

a) Suppose in the region, 40 mm of rain fell during 5 hours. What type of rain was this?

b) What would be the type of rain if 40 mm could fall during 3 hours?

c) What quantity of water (m^3) fall over an area of 1 km^2 during a rain lasted 3 hours at a rate of 2 mm/hr?