

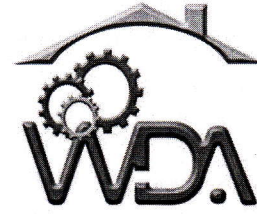
PWO – Hydraulic Works

T018

Thursday, 10/11/2016

02:00 – 05:00 pm

WORKFORCE DEVELOPMENT AUTHORITY



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**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2016,
TECHNICAL AND PROFESSIONAL STUDIES**

EXAM TITLE: Hydraulic Works
OPTION: Public Works (PWO)
DURATION: 3hours

INSTRUCTIONS:

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

Section I: Fifteen (15) compulsory questions. 55 marks

Section II: Attempt any three (3) out of five questions. 30 marks

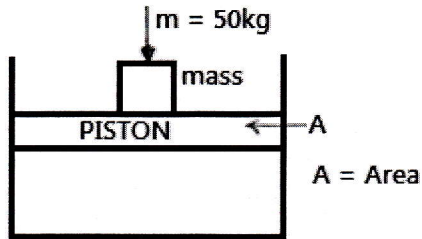
Section III: Attempt any one (1) out of three questions. 15 marks

The use of calculator is admitted.

Note:

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

01. Name three (3) states of matter. **3marks**
02. A mass m of 50kg acts on a piston of area of 100cm^2 given in figure below. Determine the pressure intensity on water in contact with the underside of the piston if the piston is in equilibrium. **4marks**

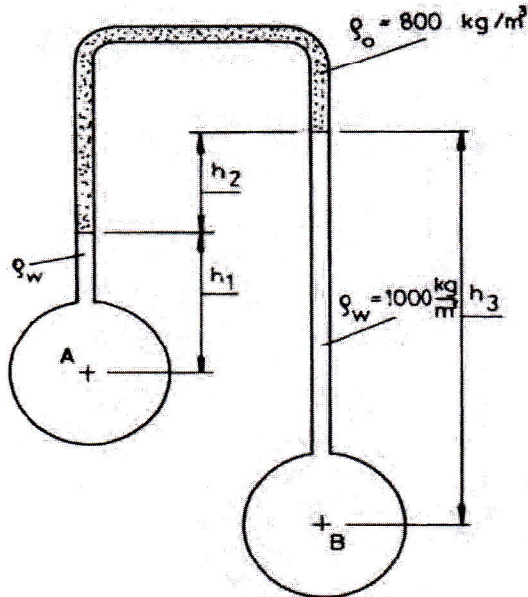


03. A venturimeter with a 150mm diameter at inlet and 100mm at throat is laid with its axis horizontal and is used for measuring the flow of oil specific gravity 0.9. The oil mercury differential manometer shows a gauge difference of 200mm. Assume coefficient of the metre as 0.98. Calculate the discharge in litres per minute. **5marks**
04. A rectangular channel is 1.5metres deep and 6metres wide. Find the discharge through channel, when it runs full. Take slope of the bed as 1 in 900 and Chezy's constant as 50. **5marks**
05. Name four (4) factors the selection of material for a culvert depends on? **4marks**
06. Give at least four (4) activities performed during the construction of culvert. **4marks**
07. List four (4) standard shapes of precast concrete culverts. **2marks**
08. Give six (6) basic components of a bridge. **3marks**
09. A liquid has volume of 6m^3 and its weight is 44kN. Determine:
- (i) Its mass density (ρ). **(1mark)**
 - (ii) Its weight density (δ). **(1mark)**
 - (iii) Its specific volume (θ). **(1mark)**
 - (iv) Its specific mass. (S). **(1mark)**
10. Enumerate four (4) uses of storage reservoirs. **4marks**
11. Give two (2) categories of earth fill dams depending upon the methods of construction. **2marks**
12. Give four (4) reasons why earth fill dams are the most common types of dams widespread used. **4marks**
13. Give two (2) types of weirs according to the nature of crest. **2marks**
14. Name four (4) types of notches depending upon their shapes. **4marks**
15. A right-angled V-notch was used to measure the discharge of a centrifugal pump. If the depth of water at V-notch is 200mm, calculate the discharge over the notch in litres per minute. Assume coefficient of discharge as 0.62 **5marks**

16. List and explain three types of loads considered in bridge construction.

10marks

17. A) In the figure below the liquids at A and B are water (ρ_w) and the manometer liquid is oil (ρ_o). $H_1=300\text{mm}$ $h_2=200\text{mm}$ $h_3=600\text{mm}$. Find pressure difference $p_A - p_B$



B) Outline and explain the factors influencing the runoff.

10marks

18. A) Outline FIVE (5) causes of dam failure.

B) List FIVE (5) types of bridges.

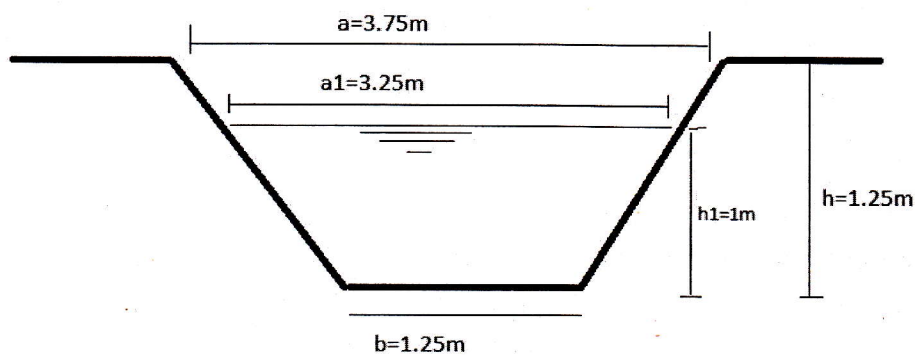
10marks

19. Sketch and show different components of a simple concrete bridge.

10marks

20. (a) Calculate the surface area of the cross section and the wetted cross-section of the canal shown below:

(b) Compare both section areas.



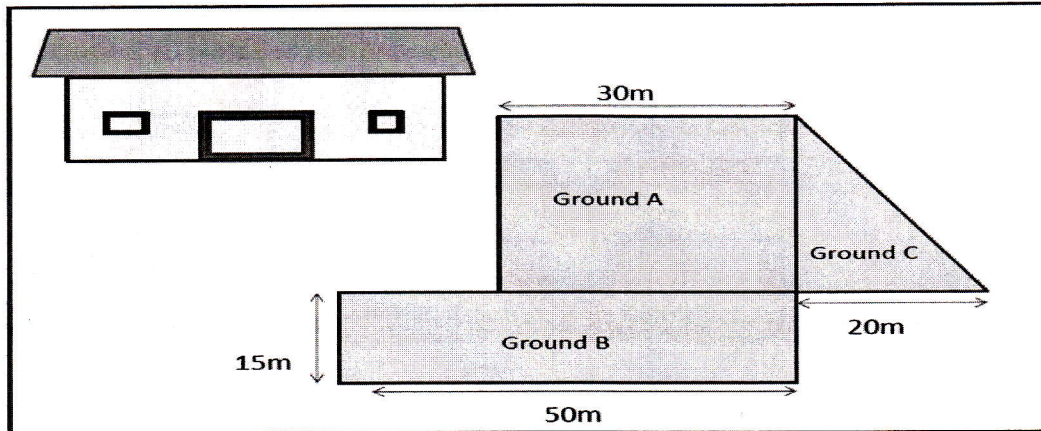
Section III. Choose and answer any one (1) question.

15marks

21. A Home owner would like to collect rain water from the catchment /ground below.

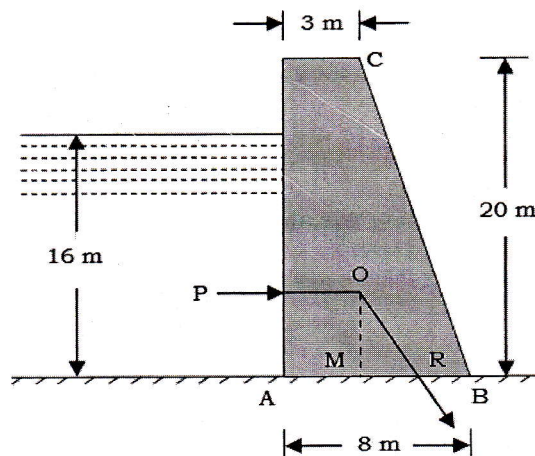
- Calculate its area (in m^2). **(9marks)**
- Find the quantity of rain water in m^3 he can harvest under the rainfall of 40mm. Consider the Runoff coefficient $C= 0.8$ **(5marks)**
- What do you think if he proposes a reservoir of $50m^3$ for water storage? **(1mark)**

Note: The ground A is a Square, ground B is a Rectangle, ground C is a Triangle



22. A concrete dam having water on vertical face is 16m high. The base of the dam is 8m wide and top 3m wide. Find the resultant thrust on the base per meter length of the dam and the point of where it intersects the base, where it contains water 16m deep. Take weight of the concrete as $23 \text{ KN}/m^3$.

15marks



- Outline four (4) main functions of a septic tank.
- Sketch and name different parts of a septic tank.

15marks