

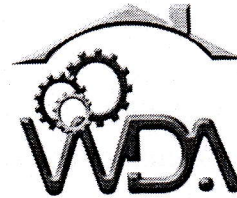
PWO – Hydraulic Works

**T067**

Thursday, 12/11/2015

14:00 – 17:00

WORKFORCE DEVELOPMENT AUTHORITY



P.O. BOX 2707 Kigali, Rwanda Tel: (+250) 255113365

**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2015,  
TECHNICAL AND PROFESSIONAL TRADES**

**EXAM TITLE: Hydraulic Works**

**OPTION: Public Works (PWO)**

**DURATION: 3hours**

**INSTRUCTIONS:**

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

Section **I:** Seventeen (**17**) questions, all **Compulsory.**

**55marks**

Section **II:** Five (5) questions, **Choose Three (3) only.**

**30marks**

Section **III:** Three (3) questions, **Choose only One (1).**

**15marks**

The use of calculator is admitted.

**Every candidate is required to strictly obey to the above instructions. Punishment measures will be applied to anyone who ignores these instructions.**

**Section I. Seventeen (17) Compulsory questions.**

**55marks**

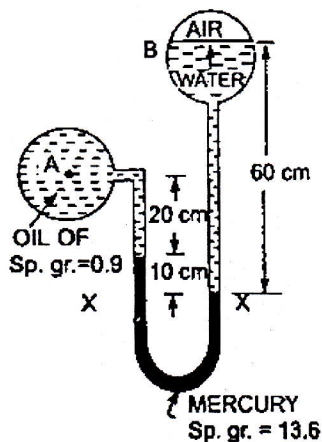
- 01.** Explain the term hydraulic. **1mark**
- 02.** What are the major areas where hydraulic is interested? **6marks**
- 03.** What are the different loads supported by the bridge? **2marks**
- 04.** Why are piers provided between two abutments? **1mark**
- 05.** What is the effect of live load on bridges? **2marks**
- 06.** On sloping ground, the highest point is 2020m height and the lowest point is 1789m height, if the catchment area (A) is 2.4km<sup>2</sup>,
- a) Calculate the horizontal distance (L) of hydraulic way between the two points. **3marks**
- b) Calculate also the average slope between the two points. **3marks**
- 07.** Explain the term septic tank. **1mark**
- 08.** Calculate the capacity in cum of a concrete septic tank which serves 15 persons. **4marks**
- 09.** List any six (6) principle elements of bridge. **3marks**
- 10.** What are the factors on which the foundation of bridge depends on? **3marks**
- 11.** Classify culverts according to their shapes. **4marks**
- 12.** An arch bridge is 5m span and 0.80m rise. Calculate the radius of intrados arch. **4marks**
- 13.** The slope distance (SD) of the existing ground with uniform slope is 141.216m and the inclination angle ( $\theta$ ) = 30°20'. Calculate the horizontal distance (HD) **5marks**
- 14.** What is the role (Function) of wing wall? **2marks**
- 15.** What are the three (3) types of materials used in building of abutment and piers of bridges? **3marks**
- 16.** List any four (4) methods of determining the bearing capacity of soil. **4marks**
- 17.** What are the different categories of construction materials used in bridge construction? **4marks**

**Section II. Answer any three (3) questions of your choice**

**(Do not choose more than three questions). 30marks**

**18. (a)** A rectangular channel 1.8m wide with a bed sloped 0.0001 carries water to a depth of 1.5m. Calculate the rate of uniform flow in the channel if the manning's roughness (N) is 0.025.

**(b)** A differential manometer is connected at the two points A and B as shown in figure below; at B air pressure is  $9.81\text{N/cm}^2$  (abs), find the absolute pressure at A.



**10marks**

**19.** Name and explain three (3) types of hydraulic reservoirs depending on the served purposes.

**10marks**

**20.** Name and explain five (5) elements of earth fill dams.

**10marks**

**21.** Differentiate an accelerometer method from the Doppler effect method used for bridge monitoring.

**10marks**

**22.** State and explain any five (5) important purposes of water resources development projects.

**10marks**

**Section III. Answer any one (1) question of your choice**

**(Do not choose more than one question). 15marks**

**23.** With sketches, state and explain any five (5) types of bridge based on structure type.

**15marks**

**24.** State and explain the three (3) classifications of culverts.

**15marks**

**25.** The various causes of earth fill dam failure may be classified in three (3) groups; state and explain them.

**15marks**