WORKFORCE DEVELOPMENT AUTHORITY

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ADVANCED LEVEL NATIONAL EXAMINATIONS, 2014
TECHNICAL AND PROFESSIONAL TRADES

EXAM TITLE: Hydraulic Works and Plumbing

OPTION: Public Works (PWO)

DURATION: 3hours

INSTRUCTIONS:

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

Section **I**: Fifteen **(15)** questions, all **Compulsory**.   **55marks**

Section **II**: Five (5) questions, **Choose any Three (3)**.   **30marks**

Section **III**: Three (3) questions, **Choose any One (1)**.   **15marks**

The use of calculator is allowed.

SECTION I. FIFTEEN (15) COMPULSORY QUESTIONS.

01. Explain the terms Hydraulic and Fluid. **4marks**

02. Explain the use of the following instruments:

(a) Pyranometer

(b) Gironette

(c) Soil thermometer

(d) Anemometer

(e) Pluviometer

(f) Barometer. **6marks**

03. A smooth concrete pipe with 0.90m diameter carries a discharge of 1.6m³/sec;

Determine:

(a) The area of concrete pipe

(b) The velocity of fluid in concrete pipe. **4marks**

04. Mention the different materials used to construct bridge. **5marks**

05. Using Chezy's formula, calculate the minimum gradient of pipe if Chezy's coefficient (C) is 65. The hydraulic mean depth (m) = 3.75 and the velocity of fluid (V) is 0.8m/sec; **4marks**

06. Name the instrument used to measure the following soil properties:

(a) Permeability of soil

(b) Densitometry of soil

(c) Compressibility of soil. **3marks**

07. Name the four (4) types of foundation for piers and abutment of bridges. **4marks**

08. List five (5) types of arch used in arched bridges. **5marks**

09. State the two general properties of engineering materials used in plumbing. **2marks**

10. Outline the four (4) seams commonly used for joining pieces of pipeline in plumbing. **2marks**

11. Outline the two (2) categories of appliances. **2marks**

12. A longitudinal canal with a trapezoidal cross-section is to be constructed in cut section. The longitudinal slope is 1 in 1800. The soil is clay, with Manning's rugosity coefficient (n) of 0.024. The maximum allowable velocity is 2.2m/sec. Find the hydraulic mean depth (R), the area (A) to be drained and the perimeter (P) if the discharge (Q) for the canal is 5cum/sec. **5marks**

13. The quantity of water (Q) flowing in a canal of rectangular form of 115cm depth and 37cm base is 27.6L/sec. The velocity of flow water (V) is 0.80m/sec.

Determine:

a) The area of fluid in canal.

b) The mean depth of water.   **4marks**

14. List any three (3) types of retaining structures.   **3marks**

**15.** What are the different methods applied for mixing of concrete?   **2marks**

SECTION II. ATTEMPT ANY THREE (3) QUESTIONS.

16. A wall of bridge supports a weight of 5150Kgf. If the thickness of that wall is 65cm and the height is 13m, the stress of ground is also 8.5Kgf/cm², the unit of the masonry equal 2100Kgf/m³. The length of wall = 7m.

Determine the rupture force of the wall and prove that the subsoil can support the weight of wall applied on it.   **10marks**

17. The following figure represents a cross-section column of a bridge:

$$D = 40cm,$$

$$B + C = 20cm$$
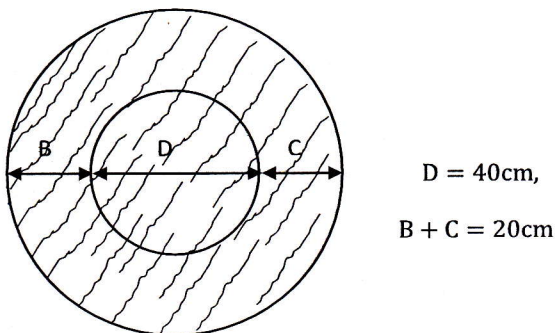
If the surface hashed represents a cement mortar applied on the column (plastering), determine the volume of mortar if the height of column is 3.30m.
                                                                                    10marks

18. a) A pipeline (A) is 25cm in diameter (inlet), and the other pipeline (B) assembled to A is 50cm in diameter (outlet). When a discharge (Q) of 75L/sec of water is passed through these pipelines, calculate the velocities V_A and V_B respectively.
                                                                                    5marks

b) What are the safety precautions in a plumbing workshop?   **5marks**

19. a. Find the area to be drained for a sockway capacity of 3.5m³ and the rainfall (R) of 0.50m/hour.   **5marks**

b. The embankment of a bridge is in fill of 9/6. What is the inclination angle of that embankment?   **5marks**

20. Using Chezy formula, calculate the discharging capacity of 165mm diameter drain flowing full when laid to a full of 1 in 50. Take C = 55.   **10marks**

SECTION III. ATTEMPT ANY ONE (1) QUESTION.

21. a. A drain has a slop distance of 345m and the difference in elevation between the lower and the highest altitude is 25m. Determine the horizontal distance of the sloping and the inclination angle β.   **5marks**

b. What is the function of retaining walls?   **2marks**

c. What are two (2) principles forces acting on a retaining wall?   **3marks**

d. Convert from sexagesimal system to centesimal system in surveying.

90°30'45" = ...? Grades.   **5marks**

22. a) A void of 10m³ must be to fill after construction of a bridge. If the settling of the laterite to be used is 0.30, find the real volume to bring for filling.   **5marks**

b) What are the types of bridges superstructure?   **7marks**

c) Give the three (3) classifications of dams based on the use.   **3marks**

23. a. Outline the types of contracts that are negotiated in hydraulic construction or other type of construction and supervision.   **6marks**

b. A drainage canal has a slope distance S of 660m and the slop angle θ is 21°20'. Find the horizontal distance H.   **4marks**

c. What are hand tools of bench work tools in workshop?   **5marks**