WORKFORCE DEVELOPMENT AUTHORITY
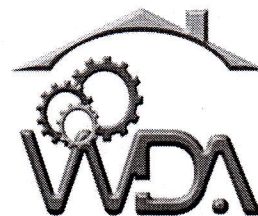
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ADVANCED LEVEL NATIONAL EXAMINATIONS, 2018, TECHNICAL AND PROFESSIONAL STUDIES

EXAM TITLE: WATER SUPPLY AND SANITATION

OPTION: Public Works (PWO)

DURATION: 3 hours

INSTRUCTIONS:

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

Section I: Twelve (12) 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.

Section I. Twelve (12) Compulsory questions   55 marks

01. Explain clearly the main purpose of road drainage system.   **(4 marks)**

02. List factors which may influence per capita demand.   **(7 marks)**

03. Mention any five requirements of a sustainable sanitation.   **(5 marks)**

04. Explain clearly the term "Dynamic pressure".   **(3 marks)**

05. Calculate the power of the pump for a maximum head of 10.39 m and a flow of 2500 m3/hr (0.694m3/s) if the pump efficiency is 84%. *MA*   **(5 marks)**

06. State two reasons from which sanitation is important.   **(3 marks)**

07. Mention any five purposes of using pumping system in water supply system.   **(5 marks)**

08. What are the three main processes of water supply system?   **(3 marks)**

09. States any four purposes of a reservoirs or tanks.   **(4 marks)**

10. Enumerate any five factors which may govern the necessity of irrigation.   **(5 marks)**

11. List any 3 advantages and 3 disadvantages of plastic material used in plumbing works.   **(6 marks)**

12. List any five fittings used in plumbing.   **(5 marks)**

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

13. (a) State and explain the two main groups of sanitary fittings.

(b) Give the three (3) considerations to be kept in mind while laying out the Pipeline.   **(10 marks)**

14. (a) Name and explain the two causes of backflow of water.

(b) Describe these water treatment processes:

(i) Boiling and (ii) Lime soda process.   **(10 marks)**

15. (a) Give five considerations followed during the design of soakway used for sewage treatment.

(b) Calculate the head of water necessary to provide a discharge of 0.2m/s through a 13mm diameter pipe 6m long.   **(10 marks)**

$$Q = \sqrt{\frac{d^5 \times H}{25 \times L \times 10^5}}$$

$$Q^2 = \frac{d^5 \times H}{25 \times L \times 10^5}$$

$$Q^2(25 \times L \times 10^5) = d^5 \times H$$

$$H = \frac{Q^2(25 \times L \times 10^5)}{d^5}$$

16.(a) Calculate the gradient required for a rectangular channel 300mm wide when the depth of water is to be 150mm flowing at a velocity of 1.5m/s.

(b) Give and explain the main types of rain gauges used for measurement of rainfall.

(10 marks)

17.(a) Distinguish the gravity and pumping water distribution systems.

(b) State and explain two types of irrigation systems.　　**(10 marks)**

Section III. Choose and answer any one (1) question.　　15 marks

18.(a) Using Chezy, Crimp, Bazin and Manning formula; Calculate the discharging capacity of a 150mm diameter drain flowing full when laid to a fall of 1 in 140 (or 1/140).

(b) List five (5) considerations taken during inspection chamber design and construction.

$$Q = C\sqrt{R} \qquad Q = \frac{1}{n}\sqrt{R \cdot C}$$

(15marks)

19. With help of sketches, describe a direct cold water supply system and indirect cold water supply system.　　**(15 marks)**

20. State and explain the three (3) categories of various micro-organisms found in water.　　**(15 marks)**