PROGRAM	:	NATIONAL DIPLOMA *Town and Regional Planning*
SUBJECT	:	**CIVIL ENGINEERING FOR PLANNERS**
CODE	:	**CES 1111**
DATE	:	SUMMER EXAMINATION 2016 29 NOVEMBER 2016
DURATION	:	(SESSION 1) 08:30 - 11:30
WEIGHT	:	50 : 50
TOTAL MARKS	:	100

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MODERATOR	:	Mr E. Makoni		
NUMBER OF PAGES	:	4 PAGES	**FILE NO:**	**2098**

INSTRUCTIONS
1. THIS IS NOT AN OPEN BOOK EXAM.
2. READ THE QUESTIONS CAREFULLY
3. WRITE NEATLY AND LEGIBLY.
4. PLEASE ANSWER ALL QUESTIONS.

Question 1

1.1   In constructing a new development in Johannesburg, the length of a trench excavation for water supply pipelines measures **21.024 km** in total. The average width of the trenches is **2.21 mm** while the average depth is **3.13 m**. Calculate the volume of the material measured in **m³** to be excavated for this pipeline. Leave your answer in three decimal places   (5)

1.2   It is estimated that by the year 2050, a new residential /light industrial development will altogether contain the following types of development:
- A central CBD of 5ha
- A commercial area of 8ha
- A light industrial area of 10ha
- A population of 8000 persons at an average density of 90 persons /ha
- Two day schools occupying 3ha together
- A hospital with 60 beds
- A garage.

Using the design guidelines provided with this paper and assuming that they are applicable to the year 2020:
   a.   Calculate the average daily water demand of the whole development in **m³/day.**   (10)
   b.   Determine the summer and maximum summer peaks water demand of the whole development in **ℓ /s**.   (10)

N/B: **Summer peak factor = 1.5; Maximum summer peak factor= 4.5; (1000ℓ = 1kℓ= 1m³)**

TOTAL FOR QUESTION 1 – 25 MARKS

Question 2

2.1   What are the effects of the following on land conditions for development?   (5)

   a.   **Clay soils –**
   b.   **Soil with high organic content**

2.2   Briefly explain these waste disposal types with regards to environmental friendliness   (5)
   a.   **Landfill –**
   b.   **Incineration**
   c.   **Gasification**

2.3   State any five landfill disposal technical considerations during its planning phase   (5)

TOTAL FOR QUESTION 2 – 15 MARKS

Question 3

3.1   Briefly discuss the reason for geotechnical study in town planning processes.   (5)

3.2   With the aid of diagrams, explain strip foundation and pile foundation differences.   (5)

3.3   Explain how groundwater affects foundation construction and how the problem can be rectified.
                                                                                              (5)

3.4   Explain any three types of energy supply to developments and which two amongst them would you recommend as economical and environmentally complaint.   (5)

TOTAL FOR QUESTION 3 – 20 MARKS

Question 4

4.1   Draw the full cloverleaf and Diamond interchanges. In addition, explain how South Africa's road network systems were modelled during 1970's and why road systems are necessary to Planners.   (10)

4.2   On one page, explain how township roads development is generally governed in terms of layout design and conflicting interests.   (5)

4.3   Draw and clearly explain each stage on how water gets from the catchment area to the kitchen tap.   (5)

TOTAL FOR QUESTION 4 – 20 MARKS

Question 5

5.1   Draw and discuss the value of the combined pumping station and gravity feed water supply. Based on the diagram, what are the give two advantages of this system to clients?   (5)

5.2   Define storm water and state clearly why its management (upstream and downstream) is crucial during developmental planning stages.   (5)

5.3   Briefly explain the 7- stages that are involved in managing solid waste.   (5)

5.4   Explain in detail how these following sewerage treatment methods are carried out: (5)
                 A: Dilution
                 B: Conservancy
                 C: Treatment (Septic tanks and Biological filters)

TOTAL FOR QUESTION 5 – 20 MARKS

TOTAL 100 marks

Annexure

DESIGN GUIDELINES FOR WATER SUPPLY

1.   GENERAL

1.1   *Definitions*

An *equivalent erf* is a unit that uses 1000ℓ water per day on average. This unit is not related to the size of the erf.

2.   DESIGN STANDARDS – PIPES

2.1   *Average daily demand*

Agricultural holdings
- Undeveloped   :   2,25kℓ/bruto ha/day
- Developed areas already subdivided   :   2,25kℓ/holding/day
- Developed areas not yet subdivided   :   4,5kℓ/holding/day for one possible subdivision
  6,75kℓ/holding/day for two possible subdivisions

Residential
- Density 30 persons/ha   :   400ℓ/person/day = 12kℓ/ha/day
- 60 persons/ha   :   250ℓ/person/day = 15kℓ/ha/day
- 90 persons/ha   :   200ℓ/person/day = 18kℓ/ha/day

Average number of persons per household (houses or flats)
:   3,1 persons/household

Commercial   :   10kℓ/ha/day

Offices   FSR = 0,2   :   6kℓ/ha/day
          FSR = 0,3   :   9kℓ/ha/day
          FSR = 0,4   :   12kℓ/ha/day

CBD General   :   16kℓ/ha/day

Light industrial   :   12,5kℓ/ha/day

General industrial   :   25kℓ/ha/day

Office park   :   10kℓ/ha/day

Water intensive industries   :   As per specific request

Special

Garage   :   8kℓ/ha
Hospital   :   0,6kℓ/bed
Café   :   4ℓ/m²
Hotel   :   4ℓ/m²
Old age home   :   0,4kℓ/inhabitant
Schools with hostels   :   8kℓ/ha + 150ℓ/inhabitant
Day schools etc.   :   8kℓ/ha

2.2   *Peak factors*

Average peak factor   -   3 x average daily demand
Summer peak   -   1,5 x average daily demand
Maximum summer peak   -   4,5 x average daily demand

2.3   *Fire fighting*

Agricultural holdings   :   No additional requirement above peak flow

All residential areas   :   15ℓ/s at 7m minimum pressure head

All others pressure   :   100ℓ/s at 15m minimum head

Supply pipelines are sized to convey the maximum summer peak and water required for fire fighting.

2.4   *Spacing of fire hydrants*

Agricultural holdings   :   600m max. spacing
All residential areas   :   250m max. spacing
All others   :   180m max. spacing

2.5   *Duration of fire flow*

Agricultural holdings   :   1 hour
Residential   :   2 hours
All others   :   4 hours

The head of the fire department should also be consulted.