Course Title: BASIC ENVIRONMENTAL ENGINEERING **Course Code:** CVE 506

Instruction: Answer FIVE (5) questions in all: THREE (3) from Part A and TWO (2) from Part B

Time allowed: 3 hours.

PART A

Question 1 (20 marks)

(a) Provide a concise definition of Environmental Engineering   **(6 marks)**

(b) Define (i)   Water Pollution   **(2 marks)**

       (ii)   Air Pollution   **(2 marks)**

       (iii)   Solid Waste Management   **(2 marks)**

(c) Outline the functions of an Environmental Engineer.   **(8 marks)**

Question 2 (20 marks)

(a) What do you understand by WATER QUALITY?   **(4 marks)**

(b) What are the constituents of municipal wastewater?   **(4 marks)**

(c) Outline the physical, chemical and biological characteristics of water and wastewater.

       (10 marks)

Question 3 (20 marks)

(a) Define the following terms related to environmental engineering:

(i)	sanitary engineering	(ii)	sanitation	(iii)	Refuse, Garbage and Rubbish
(iv)	Sullage	(v)	Sewage	(vi)	Sewerage
(vii)	Sewer	(viii)	Night soil	(ix)	Industrial sewage
(x)	Dry weather flow	(xi)	stormwater		

Question 4 (20 marks)

(a) Define BOD and describe briefly how the BOD of a wastewater sample can be estimated in the laboratory   **(10 marks)**

(b) Sketch a hypothetical BOD reaction curve showing the carbonaceous and nitrification demand curves   **(6 marks)**

(c) Express the BOD at any time as a function of the ultimate BOD and time   **(4 marks)**

Question 5 (20 marks)

(a) What are the constituents of the solid waste collected in a community such as Ilara – Mokin?   **(9 marks)**

(b) How should these solid waste at least properly disposed? State at least 3 methods of proper disposal, and the rate of the environmental engineerings   **(6 marks)**

(c) List five constituents of air pollution   **(5 marks)**

PART B
Question 6 (20 marks)
(a) On what slope should a 610 mm vitrified sewer pipe be laid in order that $0.17 m^3/s$ will flow when the sewer is half full? **(10 marks)**

(b) What will be the slope if the sewer flows full? **(10 marks)**

(Use Manning's n = 0.013)

Question 7 (20 marks)
(a) List the factors affecting stormwater quality, flow and drainage of an inhabited area **(8 marks)**

(b) Design a circular sewer to serve a locality in a town with the following data
Area = 4.86 ha; Runoff coefficient 0.6; Intensity of rain = 50 mm/hour; Average slope = 1 in 450; sewer's material Manning's n = 0.012; Assume sewer to flow half-full. **(12 marks)**

Question 8 (20 marks)
(a) Determine the ultimate first stage BOD of a waste whose 5-day BOD at 20°C is 200 mg/l. Assume the reaction constant $K_1 = 0.2$ day^{-1} (base 10) **(5marks)**

(b) The 5-day BOD of a waste is 280 mg/l. The ultimate BOD is reported at 410 mg/l. At what rate is the waste being oxidized? **(5 marks)**

(c) The 5-day BOD at 20°C of a wastewater is found to be 200 mg/l. Take k = 0.15 day^{-1} (base 10), estimate the ultimate BOD. Also, determine the 8-day BOD value at 15°C
(Note: $K_1 = K_{20} (1.047^{T-20})$ **(10 marks)**