Menoufiya University **Faculty of Eng., Shebin El-Kom** **Mechanical Power Eng. Dept.** **Date of Exam: 26/05 / 2015**		*Environmental Engineering* Code: *MPE 424A* Year : *4th Year* Time Allowed : 3 hours -*90 marks*

Question (1) **(18 Marks)**

1.1 Environmental pollution problems must be faced globally. Why? (2)

1.2 Define the following terms:

a) Ecology b) Pollution (2)

1.3 Explain with sketch the characteristics and position of ionosphere layer? (3)

1.4 What are the benefits of ozone? (2)

1.5 What are the main reasons of global warming phenomena? (2)

1.6 Explain how can wind energy help in environment conservation? (3)

1.7 Calculate the BOD_5, given the following data:

Temperature of sample, 20 °C. Initial DO is 9.2 mg/1. Dilution is 1:30, with seeded dilution water. Final DO of seeded dilution water is 8 mg/1. Final DO bottle with sample and seeded dilution water is 2 mg/1. Volume of BOD bottle is 300 ml. If the temperature of the sample is increased to 30 °C, would the BOD_5 greater or smaller and why? (4)

Question (2) **(18 Marks)**

2.1 Explain how heat is considered a source of water pollution? (2)

2.2 You are engineer working in a sewer and water company in a certain city. The weather in this city is dry. It is required to build a new sewer system in this city. Would you prefer the design of separate sewer or combined sewer and why? (3)

2.3 The concentration of Calcium in water is 50 mg/l. What is the concentration of calcium in this water in ppm? (2)

2.4 What is the main disadvantage of Winkler Dissolved Oxygen test? (2)

2.5 When are the dilution and seeding of water sample used? (2)

2.6 How can bacteriological test of water quality be done? (3)

2.7 The following data were obtained for a sample:

Total solids = 4000 mg/l
Suspended solids = 5000 mg/l
Volatile suspended solids = 2000 mg/l
Fixed suspended solids = 1000 mg/l.
Which of these numbers is questionable and why? (4)

Question (3) **(18 Marks)**

3.1 In water treatment field, what is *coagulation and flocculation?* (2)

3.2 What are the main common sense rules that must be considered for routing trucks optimization? (2)

2.3 How can particle size be controlled in vertical hammer mill in solid waste shredding? (2)

3.4 The first step in solid waste separation operation is the decrease of solid waste size. Why? (2)

3.5 Describe with sketch the function of Magnets as a solid waste separator? (3)

3.6 Describe in detail with sketch the design and construction of hazardous waste landfill? (3)

3.7 You are asked to design a resource recovery (materials separation) system for the following waste:

Component	*Fraction by Weight*
Newspaper	70
Glass bottles	15
Steel cans	10
Aluminum cans	0
Plastics	5
Garbage	0

a) Design such a system and draw a schematic diagram.

b) Discuss the next steps applied on the separated materials to make use of their components (4)

Question (4) **(18 Marks)**

4.1 Distinguish between infrasound and ultrasound? (2)

4.2 Define white noise? (2)

4.3 In acoustic science what is meant by L_{10} = 70 dB(A)? (3)

4.4 What is the main difference between primary air pollutant and secondary air pollutant? (2)

4.5 What is synergistic? Give two examples of synergism in air pollution? (2)

4.6 Which of the following are more dangerous on respiratory system and why?

Soluble or no soluble particulates (2)

4.7 Draw a map with X and Y coordinates (X horizontal, Y vertical) and place on the map the following:

Industrial Plant "A" at X = 3, Y = 3
Industrial Plant "B" at X = 8, Y = 1
Industrial Plant "C" at X = 8, Y = 8
Air Sampling Station at X = 5, Y=5

The data at the air sampling station are:

Day	1	2	3	4	5	6	7	8	9	10
Wind Direction	N	NE	NW	N	NE	SW	S	SW	E	W
Particulates ($\mu g/m^3$)	80	120	30	90	130	20	30	40	100	10
$SO_2(\mu g/m^3)$	80	20	30	40	20	180	100	200	60	100

Draw pollution roses to show which plant is guilty of the air pollution. (5)

Question (5) (18 Marks)

5.1 Specify with sketch the characteristics of both high pressure and low pressure regions? Which is preferable for better air quality condition? (2)

5.2 Is the emission of pollutants during the night in a certain city more dangerous or the emission during the day and why? (2)

5.3 Show with example and sketch that super-adiabatic lapse rate is better for the dispersion of pollutants than sub-adiabatic lapse rate. (3)

5.4 How can respirable particulate be measured? (2)

5.5 How can ozone concentration in a sample of air be measured? (2)

5.6 Describe with sketch the operation of bag filter for controlling of particulates? (3)

5.7 Given the following temperature soundings:

Elevation (m)	0	50	100	150	200	250	300
Temperature (°C)	20	15	10	15	20	15	20

What type of plume would you expect if the exit temperature of the plume were 15°C and the smoke stack were: a) 50 m tall? b) 50 m tall? c) 250 m tall? (4)

With best wishes **Dr. A. A. El-Haroun**

This exam measures the following ILOs											
Question Number	Q1-1,1-2,2-4,4-2	Q1-3,2-6,3-2,5-7,4-5	Q1-4,2-2,4-6,5-4	Q1-5,2-3,3-2,4-1	Q1-6,1-4,2-1,3-5,5-3	Q2-3,3-5,2-7,3-7	Q1-4,2-5,3-2,4-7,5-2	Q1-6,1-7,2-1,3-4,5-5	Q1-4,2-2,3-1,3-6,4-4,5-1	Q1-6,2-2,2-4,6-1,6-6	Q1-5,2-4,3-1,4-5,7-6
Skills	A6	A11	A12	A13	A18	B5	B9	C3	C15	D1	D3
	Knowledge &Understanding Skills					Intellectual Skills		Professional Skills		General Skills	