

**VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)**

M.E- DEGREE EXAMINATIONS – APR/MAY-2019

ENVIRONMENTAL ENGINEERING

First Semester

APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS

(Candidates admitted under 2017 Regulations-CBCS)

Time: Three hours

Maximum:100Marks

Answer **ALL** questions

PART – A (10 x 2 = 20 marks)

1. The first four central moments are 0, 0.25, 0.7 and 18.5 respectively. Calculate the measure of Skewness and Kurtosis on the nature of the distribution.
2. What are the types of correlation?
3. What is Sampling Distribution?
4. State any two properties of MLE
5. Write the properties of F- distribution.
6. Write the general ANOVA table for one way classification.
7. Mention any two merits and demerits of Randomized Block Design.
8. Why a 2 x 2 Latin Square is not possible?
9. Explain Vogel's approximation method.
10. What do you understand by degeneracy in a transportation problem?

PART – B (5 x 16 = 80 marks)

11. a) From the data given below, state which series is more consistent?

C.I	10-20	20-30	30-40	40-50	50-60	60-70
Series A	10	18	32	40	22	18
Series B	18	22	40	32	18	10

OR

- b) Determine the constants of the curve $y = ax^b$ which best fits the following data using the method of least square.

x:	2	3	4	5
y:	2	4.5	8	12.5

(P.T.O)

12. a) (i) Show that the sample mean \bar{X} is an unbiased estimator of $\frac{1}{\theta}$ for the

distribution $f(x, \theta) = \theta(1-\theta)^{x-1}$, $x=1, 2, \dots$ $0 < \theta < 1$

(ii) In a sample of 20 persons from a town, it was seen that 4 are suffering from T.B. Find a 95% confidence interval for the proportion of T.B patients in the town.

OR

b) Obtain the estimator of μ and σ^2 of Normal distribution by the method of moments.

13. a) 200 digits were chosen at random from a set of tables. The frequencies of the digits were

Digits	0	1	2	3	4	5	6	7	8	9
Frequency	18	19	23	21	16	25	22	20	21	15

Use the χ^2 test to assess the correctness of the hypothesis that the digits were distributed in the equal number in the tables from which these were chosen. (table value=16.919).

OR

b) Five doctors, each test 5 treatments for a certain disease and observe the number of days each patients requires to recover. The results are as follows

Doctors	Treatments				
	1	2	3	4	5
A	10	14	23	19	20
B	11	15	24	17	21
C	9	12	20	16	19
D	8	13	17	17	20
E	12	15	19	15	22

(Table Value $F_{4,16} = 5.88$)

Discuss the difference between a) Doctors b) Treatments

14. a) The three samples below have been obtained from normal population with equal variances. Test the hypothesis that the sample means are equal

Samples		
8	7	12
10	5	19
7	10	13
14	9	12
11	9	14

The value of F at 5% level of significance for $\nu_1 = 2$ and $\nu_2 = 12$ is 3.88

OR

- b) The following is a Latin square of a design when 4 varieties of seeds are being tested. Set up the analysis of variance table and state your conclusion. You may carry out suitable change of origin and scale.

A(105)	B(95)	C (125)	D (115)
C(115)	D(125)	A(105)	B (105)
D(115)	C(95)	B (105)	A (115)
B (95)	A(135)	D (95)	C (115)

15. a) Use simplex method to solve the following linear programming problem

$$\text{Maximize } z = 4x_1 + 10x_2$$

subject to

$$2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$\&x_1, x_2 \geq 0$$

OR

- b) Solve the following assignment problem which minimizes the total man hours.

Men

A B C D E

Jobs	[3	8	2	10	3]
		8	7	2	9	7	
		6	4	2	7	5	
		8	4	2	3	5	
		9	10	6	9	10]

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
FIRST SEMESTER
ENVIRONMENTAL CHEMISTRY

(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions

Part-A (10 x 2 =20 Marks)

- 1 Define redox reactions.
- 2 Write is reversible and irreversible reaction.
- 3 List out any two common organic reaction.
- 4 Define hydrolases with example.
- 5 Write any two factors which control Biotic interaction.
- 6 What is Transformation?
- 7 What are green house gases? Give examples.
- 8 What are the effects of CO (Carbon Monoxide) in humans?
- 9 What is meant by redox titration?
- 10 Define the biological properties of waste water.

PART-B (5 x 16 = 80)

- 11 a. Give an account of photo catalysis with suitable example.

OR

b. Derive an expression for the second order rate constant for two cases.
- 12 a. Describe the various mechanism of organic reactions.

OR

b. Explain the various factors which influence enzymic action.
- 13 a. Explain the factors which constitute aquatic chemistry?

OR

b. Write short notes on: a) IRC b) Speciation c) Biotic and Abiotic factors.
- 14 a. Write short note on: (i).Photochemical Smog (ii).Global effect of air pollution

OR

b. Explain various causes and control of Global warming.
- 15 a. Explain in detail about the acid base titration with one example.

OR

b. Give on account on the oxidation of SO₂ and organic compound with their effects.

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
FIRST SEMESTER
ENVIRONMENTAL MICROBIOLOGY
(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define Microorganism.
- 2 What is meant by chemotaxis?
- 3 What is the role of mitochondria in metabolic energetics?
- 4 Write notes on methanogenesis.
- 5 What are the characteristics of sewage water?
- 6 Write short notes on the control of algae in water supplies.
- 7 Name the enzymes involved in electron transport system.
- 8 Define complex medium.
- 9 Write the effects of two toxicants.
- 10 Mention any two antifungal compounds.

PART-B (5 x 16 = 80)

- 11 a. What is the classification of Taxonomy?
OR
b. Write an essay on recombinant DNA technology.
- 12 a. Explain various stages in Krebs's Cycle.
OR
b. Write briefly on (i) the Lactic acid Fermentation (ii) An oxygenic photosynthesis.
- 13 a. Explain the role of indicator organisms in water and give a brief account on fecal coliforms.
OR
b. Describe the various techniques of Virus – Concentration.
- 14 a. Briefly explain the toxic pollutants.
OR
b. Give an account on secondary treatment processes of waste water.
- 15 a. Compare the effects of acute and chronic toxicity.
OR
b. Detailed account on aerobic and anaerobic culture of bacteria.

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
SECOND SEMESTER
TRANSPORT OF WATER AND WASTEWATER

(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions

Part-A (10 x 2 =20 Marks)

- 1 What is the formula for momentum principle?
- 2 Write any two examples for Rotary pump.
- 3 What are known as project drawings?
- 4 What is pressure pipe?
- 5 List out the types of sewer materials.
- 6 What is Negative projecting conduit?
- 7 What is meant by rainfall?
- 8 What is Arithmetic mean method for calibration?
- 9 Write any two advantages of designing with the help of computer for water lines.
- 10 What is meant by Laying of Pipes?

PART-B (5 x 16 = 80)

- 11 a. Explain hydraulic flows in pipelines.

OR

- b. Explain the hydrologic cycle with a neat diagram.

- 12 a. Water has to be supplied to a town with 1lakh population at the rate 150lts per capita per day from a river, 1.8km away. The difference in elevation between the lowest water level in the sump and service reservoir is 36mts. Determine the size of the main and the Horse power of the pump required. Assume suitable data where necessary.

OR

- b. Explain the methods of optimization in water transmission.

- 13 a. Explain the different types of hydraulic sewers.

OR

- b. Explain different types of surface drains with neat sketch.

- 14 a. Explain the run-off estimation.

OR

- b. What are the methods used for computing run off? Explain in detail.

- 15 a. Describe the water distribution and sewer design.

OR

- b. Using the computer what are the appurtenances used in transmission.

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
FIRST SEMESTER
UNIT OPERATIONS AND PROCESSES IN WATER AND
WASTEWATER TREATMENT

(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions

Part-A (10 x 2 =20 Marks)

- 1 Define F/M ratio. Write its significance.
- 2 Write the power calculation equation for mechanical mixing devices.
- 3 What is meant by discrete particle settling?
- 4 Write the design criteria for a circular sedimentation tank.
- 5 What is meant by depth filter?
- 6 Name two devices used in transfer of Oxygen.
- 7 What is waste biological sludge?
- 8 What is Activated carbon?
- 9 What is specific growth rate?
- 10 What is attached growth process?

PART-B (5 x 16 = 80)

- 11 a. A reactor system reduces influent reactant concentration from 200 mg/l to 20 mg/l with detention time of 20 days. Assume the reaction is first order. Determine 'k' for CFSTR and PFR. Give comments.

OR

- b. Explain the process of flocculation and its types.

- 12 a. Design a hopper bottom for a flow of 35,000 m³/d with 60% of suspended solids (250 mg/l) assuming a suitable design criteria.

OR

- b. Write the method of flocculent particle settling.

- 13 a. Derive the expression of Gas Transfer in Liquid interface by two film theory.

OR

- b. Write and explain the commonly used filters in wastewater treatment.

- 14 a. What is breakpoint chlorination? And explain why chlorination is necessary for municipal water supply?

OR

(P.T.O)

- b. What are the Mechanisms of Disinfectant and what are the factors influencing the action of disinfectant.
- 15 a. Explain detailed about kinetics of biological growth.

OR

- b. Discuss with neat diagram about the treatment of Sewage water.

Sl.No. E-609

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
THIRD SEMESTER
ELECTIVE - SOLID AND HAZARDOUS WASTE MANAGEMENT
(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions**Part-A (10 x 2 =20 Marks)**

- 1 What are the sources of domestic solid waste?
- 2 What are the constituents of MSW?
- 3 List out the benefits associated with leachate recirculation in landfill bioreactors.
- 4 Write about the utilization of Biogas.
- 5 List the primary sources of hazardous waste?
- 6 Write about the scale of Toxicity of hazardous waste.
- 7 List the various physical treatment of hazardous waste.
- 8 Define Bioaccumulation
- 9 What are the inorganic constituents of a leachate?
- 10 Draw the typical anaerobic process for treatment of leachate.

PART-B (5 x 16 = 80)

- 11 a. Explain the impact of monthly variation in the composition of solid wastes.
OR
b. How will you estimate the moisture content of a solid waste sample?
- 12 a. With the aid of a neat sketch, explain the incineration process.
OR
b. Describe the anaerobic methods for materials recovery
- 13 a. What are the problems posed by present disposal method for hazardous waste?
OR
b. Write about the generation of hazardous waste in municipal waste.
- 14 a. Explain the process of encapsulation and solidification.
OR
b. Write about the operation – remediation of hazardous waste disposal site.
- 15 a. Write the guidelines for control of leachate from landfills.
OR
b. Write about the chemical treatment techniques for leachate control.

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
THIRD SEMESTER
ELECTIVE - INDUSTRIAL POLLUTION PREVENTION
(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Write some cleaner production options for textile industry.
- 2 What is a citizen's role in pollution prevention?
- 3 Define pollution. What are pollutant and their sources?
- 4 What is meant by source reduction?
- 5 What is meant by waste treatment?
- 6 What is meant by pay back period?
- 7 What is life cycle Assessment?
- 8 What is meant by environmental labeling? Give an example.
- 9 Draw a flowchart for auditing team in a construction industry.
- 10 Write the benefits of pollution prevention.

PART-B (5 x 16 = 80)

- 11 a. Describe the effects of industrialization on environment.
OR
b. Discuss about prevention of industrial Pollution.
- 12 a. Explain the various source reduction techniques for prevention of pollution.
OR
b. Describe the various types of barriers to pollution prevention.
- 13 a. Write a detailed note on evaluating and refining material balance.
OR
b. Describe the various waste reduction options for economic evaluation of a project.
- 14 a. Explain the Design for International Environmental Standards.
OR
b. Explain the strategies of Design for Environment.
- 15 a. Explain sustainable strategies with strategic planning model.
OR
b. Explain the PP & CP techniques followed in a sugar industry.

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
THIRD SEMESTER
ELECTIVE - OCCUPATIONAL HEALTH AND INDUSTRIAL SAFETY

(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What is a risk and how is it different from hazard?
- 2 Write the formulation of safety policy.
- 3 Write two scope of industrial psychology.
- 4 State law of conservation of energy.
- 5 What do you understand by the term chemical hazard?
- 6 What are the requirements for respirator use?
- 7 State any four functions of safety management.
- 8 Write any three types of safety audit.
- 9 What is mean by OSHA?
- 10 Explain environmental policy.

PART-B (5 x 16 = 80)

- 11 a. Write Factories act and some of its sections.

OR

- b. Write a short note on Job safety analysis and damage control.

- 12 a. What is ergonomics? Discuss the main objectives and importance of ergonomics.

OR

- b. What is industrial psychology? Discuss the influence of industrial psychology on efficiency.

- 13 a. Explain the factors influencing the effects of toxic materials.

OR

- b. What are all the golden rules of first aid?

- 14 a. Explain the types and their causes for accidents.

OR

- b. What are the approaches to prevent accident?

- 15 a. Describe the role of OSHA.

OR

- b. Brief about the aim of EMS and its advantages.

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
SECOND SEMESTER
DESIGN AND OPERATION OF WATER AND WASTEWATER
TREATMENT PLANTS

(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Mention the various types of unit operation.
- 2 What are the advantages of flocculation?
- 3 What is the principle role of screening system?
- 4 Define trickling filters.
- 5 How will you calculate the Ionic strength of a solution?
- 6 Define demineralisers?
- 7 Write any two dechlorinating Agents.
- 8 Write Short notes in organizing of plants.
- 9 What is meant by sewage farming?
- 10 Mention the various processes involved in sludge treatment & disposal.

PART-B (5 x 16 = 80)

- 11 a. Explain the disinfection process in detail.

OR

- b. Write Short notes on:-
- i) Diffused aeration
 - ii) Submerged biological contactors?
 - iii) Sequencing batch reactors?
 - iv) Membrane bioreactors
 - v) Surface aeration.

- 12 a. Designing facultative ponds and Lagoons Prepare a preliminary design for a facultative pond treatment system for the community to remove 90% of the Soluble BOD a).Waste Water flow 3000 m³/d during winter 5000m³/d during summer b).The Average temperature of the warmest month is 25⁰C. c).Average BOD₅ is 200 mg/lit with 70% being soluble. d).Reaction Coefficient K is 0.23d⁻¹ at 20⁰C $\theta = 1.06$

OR

- b. Explain Nitrification and Denitrification Process
- 13 a. Explain the Evaporation System in detail for handling the reject residue

OR

- b. Explain Denitrification Process in detail

14 a. Explain common terminology used for biological wastewater treatment.

OR

(P.T.O)

2

b. Explain Types of Aeration System.

15 a. Explain Membrane Filtration Processes.

OR

b. Explain Reverse Osmosis Membrane Process with Flow diagrams.

Sl.No. E-734

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
SECOND SEMESTER
INDUSTRIAL WASTEWATER MANAGEMENT
(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What are Common Effluent Treatment Plants?
- 2 Write few remedial measures for Environmental impacts?
- 3 Define Industrial Wastewater Treatment.
- 4 Write notes on biological oxygen demand?
- 5 What is Advanced Wastewater Treatment?
- 6 What is meant by granular media filtration?
- 7 What are chemicals used in Residual Management
- 8 What do you understand by digestion of sludge?
- 9 Name two points for petroleum Refining.
- 10 Mention the different types of physical characteristics.

PART-B (5 x 16 = 80)

- 11 a. What is the role of Regulatory Body in the Wastewater Treatment?
OR
b. Describe Toxicity of Industrial Wastewater.
- 12 a. Discuss with neat diagram about Aerobic Process.
OR
b. Explain in detail about biological treatment process.
- 13 a. Name different devices used for O₂ transfer? Explain any 2 in detail
OR
b. Describe in detail about the treatment of wastewater in any one industry.
- 14 a. Explain in Detail about the characteristics of Sludge Thickening
OR
b. Explain in Detail about the Disposal of Sludge
- 15 a. Discuss with neat diagram about the treatment of Textiles waste water.
OR
b. Explain in detail about the liquid Industrial waste Treatment.

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
SECOND SEMESTER
ENVIRONMENTAL IMPACT ASSESSMENT
(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions**Part-A (10 x 2 =20 Marks)**

- 1 What is the basic concept of EIA?
- 2 Briefly discuss the Environmental Parameters needed to conduct the EIA study
- 3 List any four projects that could affect soil environment..
- 4 What is the purpose of screening in EIA?
- 5 Write down the two alternative Evaluation
- 6 What are the environmental impacts of noise?
- 7 Write short note on environmental monitoring
- 8 Write short note on visual display materials
- 9 Enumerate the limitations of EIA
- 10 What are the steps involved in the Assessment of EIA?

PART-B (5 x 16 = 80)

- 11 a. i) What are the typical impacts of development projects on land environment?
OR
b. (i) Explain the difference between "Environmental indicator" and 'Environmental
- 12 a. How do you predict impacts on the surface water environment?
OR
b. With the help of a neat schematic, explain phases of municipal wastewater
- 13 a. What are the evaluation criteria for EIA process? Explain in detail.
OR
b. Explain in detail about steps to be taken for Methodology.
- 14 a. Describe about the Detailed Planning Phase.
OR
b. Explain in detail about writing suggestions on E.I R.
- 15 a. Explain the main objectives of E.I.A
OR
b. Environmental Impact Assessment on Noise. Explain any case study

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
SECOND SEMESTER
ELECTIVE - AIR POLLUTION CONTROL
(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions**Part-A (10 x 2 =20 Marks)**

- 1 What are Secondary air pollutants?
- 2 Differentiate aliphatic and aromatic air pollutants
- 3 What do mean by wet adiabatic lapse rate?
- 4 What are the self cleaning properties of environment?
- 5 What are the demerits of CFC?
- 6 What are the devices employed in control of particulate matter?
- 7 Lead casting Industry. Name the pollutants.
- 8 What are the air pollutants named as “Critical Three”?
- 9 What are the effects of noise pollution
- 10 How do you Measure sound.

PART-B (5 x 16 = 80)

- 11 a. Explain photo chemical smog and coal – induced smog
OR
b. Explain the effects of air pollution on materials and plants.
- 12 a. What are wet collectors? Discuss the advantages and drawbacks of wet collectors and mention the salient features of spray tower, wet cyclone scrubber and venture – scrubber.
OR
b. Explain the working of high volume air sampler, with a sketch.
- 13 a. Write Short Note on Bubble cap packed Tower.
OR
b. Discuss the adverse effects of carbon monoxide on human health. How can the reduction in carbon monoxide emission help mitigate these effects?
- 14 a. Describe in detail about the pollution in the Glass Industry.
OR
b. Case Study: Effect on Art Treasure like Taj Mahal.
- 15 a. What are the sources and causes of noise pollution?
OR
b. Write Short Notes on : a) Noise from consumer products b) Rail Road Noise

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
M.E -DEGREE EXAMINATIONS- APR/MAY - 2019
ENVIRONMENTAL ENGINEERING
SECOND SEMESTER
ELECTIVE - CLEANER PRODUCTION
(Candidates admitted under 2016 Regulations-CBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions

Part-A (10 x 2 =20 Marks)

- 1 Name type of CP strategies.
- 2 What is a CP audit?
- 3 What is cleaner production concept?
- 4 Write short note on raw material substitution
- 5 What is cash flow concept
- 6 Define environmental feasibility
- 7 What is improvement analysis?
- 8 Enumerate the demerits of LCA
- 9 What is cleaner production?.
- 10 Name the Treatment sequence.

PART-B (5 x 16 = 80)

- 11 a. Name the Barriers and explain any two.
OR
b. Describe in detail about the Environmental impact on humans from Waste water.
- 12 a. Explain the role of Government and institutions in cleaner production
OR
b. List out the barriers of cleaner production
- 13 a. Write an essay on criteria for selection of projects
OR
b. Write the financial analysis of pollution prevention projects
- 14 a. Give a detailed account of Type – 2 LCC Model
OR
b. Implementation of ISO 14001, What factors has to be considered?
- 15 a. Case Study of Effluent Treatment Plant. Detail with a neat sketch.
OR
b. Describe about Technical barrier and Economic Barrier
