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**P868**

**[4035]-302**

**M.Sc. (Sem. - III)**

**ENVIRONMENTAL SCIENCE**

**ENV - 302 : EIA & ENVIRONMENTAL AUDITING**

**(New) (2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Answers to the two sections should be written in separate books.*

**SECTION - I**

**Q1)** Solve any two from the following :

- a) Explain in brief the administrative procedure for EIA studies.
- b) Briefly write the salient features of EIA notification of 2006.
- c) What are the advantage and disadvantage of public participation.

**Q2)** Attempt any two from the following :

- a) Explain the importance of baseline data in EIA studies.
- b) What are the inherent problems in implementation of public participation programme.
- c) Briefly narrate the generic topical outline for an environmental impact - report.

**Q3)** Solve any two from the following :

- a) Explain the steps in risk management.
- b) Write the salient features of 2006 EIA notification.
- c) What are the basic steps involved in EIS report preparation.

**Q4)** Write a short note on any two :

- a) LCA
- b) Solid Waste Audit.
- c) Conceptual framework in EIA.

***P.T.O.***

## SECTION - II

**Q5)** Solve any two from the following :

- a) Explain the impact analysis of socio - economic environment in sugar industry.
- b) What are the objectives and scope of environmental audit.
- c) Briefly explain the salient feature of environmental protection act. 1986

**Q6)** Attempt any two from the following :

- a) What are the basic steps involved in Environmental statement report preparation.
- b) Differentiate between objectives based and client driven type environmental audit.
- c) Explain the Box - modal approach in impact prediction of air environment.

**Q7)** Solve any two from the following :

- a) Explain the importance of brise environment assesment in EIA studies.
- b) Explain the conceptual frame work approach to the socio - economic environment.
- c) What are the criteria for solution of appropriate procedure for Environmental management plan.

**Q8)** Write short notes on any two :

- a) Mitigation.
- b) Adhoco method.
- c) The scaling - weighting techniques.



**P862****[4035]-104****M.Sc. (Sem. - I)****ENVIRONMENTAL SCIENCE****ENV - 104 : Statistical and Research Methods****(2008 Pattern) (New)***Time : 3 Hours]**[Max. Marks : 80**Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**SECTION - I****Q1)** Answer any two of the following:

- a) Monthly consumption of electricity in units of a certain family in a year given below.  
210, 207, 315, 250, 240, 232, 216, 208, 208, 215, 300, 290.  
Compute arithmetic mean, median and mode of the consumption of electricity.
- b) Write short note on ogives.
- c) Calculate quartile deviation for the following data.  
Variable : 20-29    30-39    40-49    50-59    60-69    70-79  
Frequency : 306        182        144        96        42        34

**Q2)** Answer any two of the following:

- a) Residual mercury of effluent sample collected from different sites of a channel was estimated in winter.  
The following data were obtained.

Sites :	1	2	3	4	5	6	7	8	9	10
Residual Hg :	1.5	2.5	1.7	2.0	0.9	1.6	0.8	2.2	2.1	2.6

Find coefficient of variation.

- b) If 3 of 20 tires are defective and 4 of them are randomly chosen for inspection. What is the probability that only one of the defective tires will be included?
- c) Explain "What do you mean by Kurtosis"? Also explain different types of Kurtosis.

***P.T.O.***

**Q3)** Answer any two of the following:

- a) Find the coefficient of correlation between inflorescence length (X) and number of flowers (Y) in eight randomly selected Salvia plant, from the following data.

$$\sum X=131, \sum Y=90, \sum XY=1506, \sum X^2=2181, \sum Y^2=1048.$$

- b) Define the following terms:  
i) Sample space.  
ii) Event.  
iii) Classical definition of probability.
- c) State the probability mass function of binomial distribution. Also state mean and variance.

**Q4)** Answer any two of the following:

- a) The following results were obtained from records of age (X) and Systolic blood pressure (Y), of a group of 10 men.

	X	Y
Mean	53	142
Variance	130	165

$$\sum(X - \bar{X})(Y - \bar{Y})=1220$$

Fit a regression line of Y on X. Also estimate the blood pressure of a man with age 45 years.

- b) It has been claimed that in 60% of all solar heat installations the utility bill is reduced by at least one third. Find the probability that the utility bill will be reduced by at least one-third in at least four of five installations.
- c) Calculate the standard deviation for the following data giving the age distribution of 542 members of parliament.

Age:	25	35	45	55	65	75	85
No. of Members:	3	61	132	153	140	51	2

## SECTION - II

**Q5)** Answer any two of the following:

- a) Define the following with illustrations.  
i) Parameter.  
ii) Statistic.  
iii) Null hypothesis.  
iv) Alternative hypothesis.  
v) Critical region.

- b) Number of road accidents on a high way during a month follows a Poisson distribution with mean 5. Find the probability that in a certain month number of accidents on the highway will be less than 3.
- c) Define “analysis of variance”. State the hypothesis in two way ANOVA. Also give the ANOVA table in two way ANOVA.

**Q6)** Answer any two of the following:

- a) Explain what do you mean by “Time Series”. State the components of time series and explain any one of them.
- b) It is known that the height of men in a certain city is normally distributed with an average of 171.25 cm and SD of 9.5 cm. How many men in a random sample of 1000 selected from this city would you expect to have height more than 180 cm.
- c) Define the regression coefficients and state the properties.

**Q7)** Answer any two of the following:

- a) Calculate the mode from the following data.

Wt. of apples: in gm.	30 and below	31-60	61-90	91-120	121-150	above 150
No. of apples:	22	198	110	95	42	33

- b) Explain Chi-square test of goodness at fit.
- c) Explain what is central tendency. State various measures of central tendency.

**Q8)** Answer any two of the following:

- a) Explain stratified sampling with illustrations.
- b) Selfed progenies of a cross between pure strains of plants were segregated as follow:

	Early flowering	Late flowering
Tall	120	48
Short	36	12

Test whether there is association between stature and period of flowering.  
[Use  $\alpha = 0.05$ ]

- c) Draw the normal curve. Also state the properties of normal curve of normal distribution.





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**P866**

**[4035]-204**

**M.Sc. (Sem. - II)**

**ENVIRONMENTAL SCIENCE**

**ENV - 204 : Environmental Law, Ethics & Policy**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *All questions carry equal marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

**Q1)** Attempt any two of the following:

- a) Explain in brief the importance of Stockholm Conference in International Environmental Law.
- b) Write a note on the International legal efforts on ozone depletion.
- c) Write short notes on:
  - i) National Environmental Policy.
  - ii) International laws as to prevention and control of acid rain.

**Q2)** Answer any two of the following:

- a) What was the outcome of Rio + 5?
- b) What is the role of International law to control global warming.
- c) Write short notes on:
  - i) Ecological growth factor for sustainable development.
  - ii) Future of Environmental Laws as regards pollution control.

**Q3)** Answer any two of the following:

- a) Write in brief about the provision of Indian Constitution for protection of environment.
- b) Explain how sustainable development has been the objective of the Environment legislation in India.
- c) Write notes on the following:
  - i) Objective of the Environment Protection Act 1986.
  - ii) Reconciliation of Development Goals and Environmental Equity.

***P.T.O.***

**Q4)** Attempt any two of the following:

- a) Explain the provision of Indian Penal Code towards environment protection.
- b) What are the requirement of an Environmental audit.
- c) Write short notes on:
  - i) Provision of the Motor Vehicles Act about air pollution control.
  - ii) Environment Protection under Panchayat Raj System.

## **SECTION - II**

**Q5)** Attempt any two of the following:

- a) State the International law of protection of Biodiversity.
- b) Write the effects of natural v/s man made growth.
- c) Write notes on:
  - i) Comparison between Exploitation and Safe guard for conservation.
  - ii) Environmental Impact Assessment.

**Q6)** Explain any two of the following:

- a) Explain the power of State Boards.
- b) What is the liability of companies under water Act?
- c) Write short notes on:
  - i) Legal rules as to disposal of Biomedical Waste.
  - ii) Draw backs of traditional development.

**Q7)** Answer any two of the following:

- a) What are Rule regulation and guidelines given for disposal of hazardous waste.
- b) Write about legal protection of endangered species.
- c) Write short notes on:
  - i) Pollute pays principle.
  - ii) Intergenerational Equity.

**Q8)** Discuss any two of the following:

- a) What are the International legal measures to protect marine environment.
- b) Discuss the cost benefit analysis.
- c) Write in brief about the Bhopal Gas Disaster.





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**P867**

**[4035]-301**

**M.Sc. (Sem . - III)**

**ENVIRONMENTAL SCIENCE**

**ENV - 301 : Air Pollution & Climate Change**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *All questions carry equal marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

**Q1)** Attempt any two of the following:

- a) What are the major factors contributing to the air pollution?
- b) Discuss the reactions in the Troposphere.
- c) Write in brief classification of air pollutant.

**Q2)** Attempt any two of the following:

- a) Define air pollution and add a note on their effect on plants.
- b) Discuss in detail emission of air pollutant from vehicle.
- c) Write a note on dispersion of Vehicular Pollution.

**Q3)** Attempt any two of the following:

- a) What are green gases? Discuss in detail Green house effect.
- b) What are aerosols? Write its role in cloud seeding.
- c) What are principle causes of industrial pollution?

**Q4)** Write short notes (Any two) on the following:

- a) Monitoring of SO<sub>2</sub>.
- b) Ozone depletion.
- c) Effect of SPM on Human.

**P.T.O.**

## SECTION - II

**Q5)** Answer any two of the following:

- a) Explain with examples the control of air pollution by process modification.
- b) What are the criteria used in selection of air pollution control equipment?
- c) Describe the working of a particulate control equipment based on charge separation.

**Q6)** Attempt any two:

- a) List the different types of scrubbers. Describe any one in detail with diagram.
- b) Give the principle, advantages & limitations of condensers. What are the types of condensers?
- c) Differentiate between adsorption and absorption technique for the removal of gaseous pollutants.

**Q7)** Answer any two:

- a) What are the salient features of Kyoto Protocol?
- b) Write about the background and working of IPCC.
- c) Describe the effects of global warming.

**Q8)** Write short notes on any two:

- a) Zoning for air pollution control.
- b) Operating problems of cyclone.
- c) Pulse jet cleaning.



Total No. of Questions : 8]

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**P1163**

**[4035]-11**

**M.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV - 101 : Fundamental of Environmental Science  
(Old)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) Attempt not more than five questions of which at least two questions must be from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All questions carry equal marks.*

**SECTION - I**

- Q1)** Describe the principles and scope of environmental science and add a note on ancient agenda for environment as placed in Sanskrit.
- Q2)** Discuss the various views regarding origin of atmosphere and add a note on structure of the atmosphere.
- Q3)** Explain the seasons and climate occurring on the earth and give their relation to the sun.
- Q4)** Write notes on any three of the following :
- a) Basic of biosphere.
  - b) Ecotone.
  - c) Energy flow in ecosystem.
  - d) Physical properties of ocean water.

**SECTION - II**

- Q5)** Write a brief account on the biogeochemical cycles. Explain Oxygen cycle in detail.
- Q6)** Define Habitat? Discuss in detail terrestrial ecosystems.
- Q7)** Describe the various zones of natural resources and add a note on its conservation.

***P.T.O.***

**Q8)** Write notes on any two of the following :

- a) Current development in environmental sciences.
- b) Basic of lithosphere.
- c) Sub division of ecology.
- d) Food Web.



Total No. of Questions : 8]

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**P1164**

**[4035]-13**

**M.Sc. (Sem. - I)**

**ENVIRONMENTAL SCIENCE**

**ENV - 103 : Environmental Biology**

**(Old)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) Attempt not more than five questions of which at least two questions must be from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All questions carry equal marks.*

**SECTION - I**

- Q1)** Explain the importance of microorganism in animals and plants with suitable examples. Add a note on extremophilic microorganisms.
- Q2)** Explain the importance of biotic and edaphic factors in the development of biotic community in terrestrial biomes with suitable examples.
- Q3)** What is the ecological status of forest and semi-arid land in India? Add a note on their conservation measure.
- Q4)** Write notes on any three of the following :
- a) Ecological niche.
  - b) Anti microbial agents.
  - c) Population explosion.
  - d) Types of wetland.

**SECTION - II**

- Q5)** What are the criteria for to incorporate the threaten species in IUCN category? Explain in brief the extinct species in India.
- Q6)** Explain the salient features of RAMSAR convection. Add a note of its importance in ecological balance.

***P.T.O.***

**Q7)** Which are the factors influencing the wild life management? Add a note on importance buffer zones and development activities in forest areas.

**Q8)** Write notes on any two of the following :

- a) Red data Book.
- b) *in situ* conservation.
- c) Salient features of National Forest Policy.
- d) Quarantine regulation.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P1165**

**[4035]-31**

**M.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV - 301 : Environmental Planning : Rural & Urban  
(Old)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) Attempt not more than five questions of which at least two questions must be from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All questions carry equal marks.*

**SECTION - I**

- Q1)** Describe the important concepts and parameters for environmental planning. Add a note on state and national laws and acts to protect the environment.
- Q2)** Explain the various parameters and importance of environmental planning in Urban development. Add a note on the Industrial and Business growth pattern in an Urban Development.
- Q3)** Write in brief on methods of Environmental Audit. Add a note on environment audit and its importance for industries.
- Q4)** Write notes on any three of the following :
- a) Waste minimization and waste utilization.
  - b) Onsite and off site management strategies.
  - c) Effect of rural development.
  - d) Natural resources and exploitation.

**SECTION - II**

- Q5)** What is Hazardous waste? Discuss the various rules, regulations and guidelines given for disposal of Hazardous.
- Q6)** Give a critical review of drawbacks in traditional evaluation of development. Add a note on Cost benefit analysis.

***P.T.O.***

**Q7)** Explain the various advantages and disadvantages of public participation environmental and development.

**Q8)** Write notes on any two of the following :

- a) Disaster Management.
- b) Bio-medical Waste.
- c) Merits and demerits of agro-forestry in sustainable development.
- d) Current development in environmental planning.





Total No. of Questions : 8]

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**P1166**

**[4035]-42**

**M.Sc. (Sem. - IV)**

**ENVIRONMENTAL SCIENCE**

**ENV - 402 : Environmental Health & Safety  
(Old)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) Attempt not more than five questions of which at least two questions must be from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All questions carry equal marks.*

**SECTION - I**

- Q1)** Explain the importance of health, safety and occupational environment in development process with suitable example.
- Q2)** What are the criteria for identification of the health hazards in industrial projects? Add a note on the strategic planning for risk minimization.
- Q3)** What are the Indian standards for safety and health? Explain the objectives of participation in safety programme.
- Q4)** Write notes on any three of the following :
- a) Biological safety.
  - b) Mock drill.
  - c) Risk identification.
  - d) Noise control measures.

**SECTION - II**

- Q5)** What is hazardous waste? Classify it and add a note on metabolic disorders caused due to lead in fauna.
- Q6)** Briefly explain the OECD guidelines for acute and chronic toxicity testing. Add a note on inhalation toxicity.

***P.T.O.***

**Q7)** Explain the potential and widespread effect of epidemic diseases. Add a note on preventive and curative measures for tuberculosis in human beings.

**Q8)** Write notes on any two of the following :

- a) Dispersion of air pollutants.
- b) Role of NGO in sanitation Programme.
- c) Physiological effect of organic solvent.
- d) Biological weapons.



Total No. of Questions : 8]

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**P1167**

**[4035]-43**

**M.Sc. (Sem. - IV)**

**ENVIRONMENTAL SCIENCE**

**ENV - 403 : Information Technology and Bio-Informatics for  
Environmental Science  
(Old)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) Attempt not more than five questions of which at least two questions must be from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All questions carry equal marks.*

**SECTION - I**

- Q1)** Explain the concepts and foundation of Remote Sensing? Give aerial photo classification based on attitude of camera lens, and add a note on distortions caused due to flight irregularities.
- Q2)** Describe the principles of thermal infrared and microwave image interpretation. Add a note on its applications in marine studies.
- Q3)** Discuss the different type of photo recognition elements and various factors controlling them. Add a note on Atmospheric window.
- Q4)** Write notes on any three of the following :
- a) Sources of EMR and its interaction with the earth.
  - b) Land Sat.
  - c) White and grey bodies.
  - d) Remote sensing applications in Hazard Management.

**SECTION - II**

- Q5)** “Internet and websites are the present and futuristic need of environmental sciences”. Justify the statement with suitable examples.
- Q6)** Describe the term LAN and WAN. Give the signification of network system with a note on network topology.

***P.T.O.***

**Q7)** Explain the role of Landsat TM and SPOT imagery for land cover mapping. Add a note on latest computer software used in land covers mapping using TM and SPOT imagery.

**Q8)** Write notes on any two of the following :

- a) Global Positioning System.
- b) Current Development in Bioinformatics.
- c) RADARSET.
- d) IKONOS-1.



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**P859**

**[4035]-101**

**M.Sc. (Sem. - I)**

**ENVIRONMENTAL SCIENCE**

**ENV - 101 : Environmental Geosciences**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

**SECTION - I**

**Q1)** Attempt any two of the following :

- a) Differentiate between geostrophic wind and gradient wind.
- b) Discuss the green house effect in brief.
- c) Describe the effect of terrestrial radiation on earth's atmosphere.

**Q2)** Answer any two of the following :

- a) Describe in brief the evolution of earth's atmosphere.
- b) Draw and describe the structure of earth's atmosphere.
- c) Give the chemical composition of earth's atmosphere.

**Q3)** Explain any two of the following :

- a) Explain various factors affecting wind.
- b) Explain the role of temperature on environmental lapse rate.
- c) Explain how Thunderstorms are created.

**Q4)** Write notes on any two of the following :

- a) Heat budget.
- b) Soil profil.
- c) Droughts.

***P.T.O.***

## **SECTION - II**

**Q5)** Attempt any two of the following :

- a) Describe in brief the internal structure of Earth.
- b) Discuss in brief the sedimentary rocks and its classification.
- c) Give various parameters responsible for physical weathering of rocks.

**Q6)** Answer any two of the following :

- a) Explain and draw a soil profile.
- b) Explain “Ice sheets and fluctuation of sea levels.
- c) Write in brief hydrological cycle.

**Q7)** Attempt any two of the following :

- a) Discuss the origin and composition of sea water.
- b) Describe the various mitigation measure taken to reduce Earthquake hazards.
- c) Give the classification of trace element in environmental geochemistry.

**Q8)** Write notes on any two of the following :

- a) Geochemical cycles.
- b) Landslides.
- c) Diseases induced by human use of land.



**P860**

**[4035]-102**

**M.Sc. (Sem. I)**

**ENVIRONMENTAL SCIENCE**

**ENV - 102 : Environmental Chemistry**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

**SECTION - I**

**Q1)** Answer any two from the following :

- a) Sketch a neat labelled diagram of carbon cycle in environment.
- b) What is primary and secondary amino acids.
- c) Write a brief note on DNA structure.

**Q2)** Solve any two from the following :

- a) What are the carcinogenic effect of inorganic compounds.
- b) How the plastic biodegradation occur in nature.
- c) Explain the non-ionic detergents with suitable example.

**Q3)** Answer any two from the following :

- a) Differentiate between cationic, anionic and non-ionic detergents.
- b) What is the effect of Lead on flora on fauna.
- c) What is role of photosensitize additives in polymer decay.

**Q4)** Write short notes on any two :

- a) Types of RNA.
- b) Pesticide analysis techniques.
- c) Types of mutation.

## SECTION - II

**Q5)** Attempt any two from the following :

- a) Explain the principle of Gas chromatography.
- b) Sketch a neat and labelled diagram of ion exchange chromatography.
- c) What are the limitations of polarographic technique.

**Q6)** Solve any two from the following :

- a) Which are the factor influences the dissolving gases in water.
- b) Explain the methods for destruction of chromium.
- c) How the stock quantity of a flatoxin is denatured.

**Q7)** Write answer - any two

- a) Explain various components of HPLC.
- b) What are the limitations in colorimetric analysis.
- c) Define the terms : Specific resistance, specific conductance, and equivalent conductance.

**Q8)** Write notes on any two of the following :

- a) Radionuclides.
- b) Photosensitize additives
- c) Merits and demerits of Neutron Activation analysis.





**P861**

**[4035]-103**

**M.Sc. (Sem. - I)**

**ENVIRONMENTAL SCIENCE**

**ENV - 103 : Environmental Biology**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

**SECTION - I**

**Q1)** Attempt any 2 of the following :

- a) Briefly explain concept of ecotone.
- b) Define Ecosystem. Write a note on components of Desert ecosystem.
- c) What are ecological pyramid? Add a note on 'pyramid of numbers'.

**Q2)** Answer any 2 of the following :

- a) Briefly explain age structure of population.
- b) Components of Nitrogen cycle in Terrestrial ecosystem.
- c) What is biodiversity? Add a note on its types.

**Q3)** Justify any 2 of the following :

- a) Role of wetland as a habitat potential for birds.
- b) Y-shaped energy flow model in ecosystem.
- c) Role of extremophiles in Environment.

**Q4)** Write a short note on any 2 of the following :

- a) Natality and Mortality.
- b) Gir Lion Project.
- c) What is Eutrophication? Add a note on its types.

## SECTION - II

**Q5)** Attempt any 2 of the following :

- a) What are factors influencing coastal ecosystem?
- b) How Biosphere Reservoir are important for Wildlife Management?
- c) Clarify phytoremediation, with suitable example.

**Q6)** Answer any 2 of the following :

- a) What is Red Data Book?
- b) What are threatened species? Add a note on threatened species of animals in India.
- c) What is protected Area Network? Add a note on its needs.

**Q7)** Justify any 2 of the following :

- a) Mangrooves as a breeding ground.
- b) Role of IUCN in Wildlife Conservation.
- c) Productivity of marine ecosystem.

**Q8)** Write a short note on any 2 of the following :

- a) Define In-situ and Ex-situ conservation. Add a note on In-situ conservation.
- b) Role of National Forest Policy in Forest Protection.
- c) Keystone species.



Total No. of Questions : 8]

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**P863**

**[4035]-201**

**M.Sc. (Sem. - II)**

**ENVIRONMENTAL SCIENCE**

**ENV - 201 : Environmental Economics  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

**SECTION - I**

**Q1)** Answer any two from the following :

- a) Discuss the problems associated with externalities.
- b) Enlist the factors considered to design an environmental policy.
- c) What is the theory of public good?

**Q2)** Justify the statement (Any two) :

- a) Market failure has an adverse effect on environmental planning.
- b) Social cost is to be considered for environmental policy on priority basis.
- c) Environment and economy have positive as well as negative relationship.

**Q3)** Attempt the following questions (Any two) :

- a) Define the role of micro-foundation in environmental economics.
- b) What are the advantages of environmental understanding in the economy.
- c) Discuss the need of international comparisons in environmental economics.

**Q4)** Write notes on (Any two) :

- a) Market failure.
- b) Incentives and subsidies.
- c) Economic instruments.

***P.T.O.***

## **SECTION - II**

**Q5)** Answer any two from the following :

- a) What are the salient features of Kyoto protocol.
- b) Discuss the need of non-renewable resource promotion programme in Indian continent.
- c) What are the demerits of migration of population.

**Q6)** Attempt any two from the following :

- a) Explain the methods of cost-benefit analysis and its utilities to identify social cost.
- b) Explain the impact of Foreign Direct Investment (FDI) in flow in development programme.
- c) Discuss the effects of subsidies on environmental programme.

**Q7)** Answer any two from the following :

- a) Define sustainability indicators and their significance in policy instrument.
- b) “Carbon trading in effective tool in environmental policy. Justify.
- c) Which are the different adaptations available for climate change.

**Q8)** Write short notes on any two :

- a) UNEP.
- b) Global Warming.
- c) Micro-and macro planning.



**P864**

**[4035]-202**

**M.Sc. (Sem. - II)**

**ENVIRONMENTAL SCIENCE**

**ENV - 202 : Water & Waste Water Engineering  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

**SECTION - I**

**Q1)** Answer any two of the following :

- a) What is meant by design period and population forecast? Why is population forecast necessary in the design of public water supply system?
- b) Write about the quality of water required for industrial consumption.
- c) What are different sources of water? Elaborate one.

**Q2)** Attempt any two of the following :

- a) Explain the importance of chemical and bacteriological analysis of water used for domestic purpose.
- b) What is coagulation? Explain the mechanism and write about the different chemicals used as coagulants.
- c) Sketch a neat labelled diagram of rapid sandfilter.

**Q3)** Answer any two of the following :

- a) What are the advantages and limitations of zeolite softener?
- b) The maximum daily demand of water purification plant is 12 MLD. Design a suitable sedimentation tank. Velocity of flow is 20 cm/m.
- c) Explain the different methods for disinfection.

**Q4)** Write short notes on any two :

- a) Break point chlorination.
- b) Demineralization process.
- c) Reverse osmosis.

### **SECTION - II**

**Q5)** Answer any two of the following :

- a) Write about the necessity of tertiary treatment of waste water. Also give its significance.
- b) Sketch a neat labelled diagram of grit chamber. Why is it located at the beginning of treatment plant?
- c) What are the design criteria for trickling filter?

**Q6)** Attempt any two of the following :

- a) What are the different types of aeration? Give the advantages of diffused aeration.
- b) What are the criteria for disposal of effluent on land?
- c) What is the principle of activated sludge process? Add a note on the significance of sludge recycling.

**Q7)** Answer any two of the following :

- a) What is bioremediation? Explain the various types of bioremediation.
- b) Sketch a flowsheet for the pulp and paper mill ETP. Add a note on green liquor treatment.
- c) What is the significance of anaerobic treatment of wastewater? What are the different models of reactors?

**Q8)** Write short notes on any two :

- a) Diurnal variation in sewage flow.
- b) UASB process.
- c) Sludge bulking.



**P865**

**[4035]-203**

**M.Sc. (Sem. - II)**

**ENVIRONMENTAL SCIENCE**

**ENV - 203 : Environmental Pollution : Water & Soil  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

**SECTION - I**

**Q1)** Attempt any two of the following :

- a) What is pollution? Discuss different types of water pollution.
- b) Write in detail effect of biological pollutant on water.
- c) What is water quality? Enlist the standards of water.

**Q2)** Answer any two of the following :

- a) What is soil profile? Give importance of soil profile.
- b) Discuss the sources of soil pollution.
- c) "Industrial effluent pollute the river water". Justify.

**Q3)** Attempt any two of the following :

- a) What are the specification used for disposal of sewage in marine system.
- b) Write in brief effect of industrial discharge on land.
- c) What are the effect of water pollution on human health?

**Q4)** Write short notes on (any two) of the following :

- a) Characteristics of Agricultural Waste.
- b) Grab Sampling.
- c) Inorganic pollutant.

## **SECTION - II**

**Q5)** Attempt any two of the following :

- a) What are the anthropogenic sources of radiation? Explain any one in detail.
- b) Explain in brief “biological effects of ionizing radiations”.
- c) Draw schematic diagram of scintillation counter and explain its working.

**Q6)** Answer any two of the following :

- a) Discuss – “disposal methods for toxic organic compounds”.
- b) Explain in brief “open cast mining”.
- c) What is fly ash? Explain effects of fly ash.

**Q7)** Attempt any two of the following :

- a) Give the classification of solid waste.
- b) What is solid waste? Describe the techniques used for separation of solid waste.
- c) Explain in detail “working of ideal land fill technique for solid waste”.

**Q8)** Write short notes on any two :

- a) Dumping of mining waste.
- b) Composition of solid waste.
- c) Long term effects of radiation.





Total No. of Questions : 8]

[Total No. of Pages : 2

**P869**

**[4035]-303**

**M.Sc. (Sem. - III)**

**ENVIRONMENTAL SCIENCE**

**ENV - 303 : Remote Sensing & GIS**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

**Q1)** Attempt any two of the following :

- a) What is Remote Sensing? Write in detail types of remote sensing.
- b) Describe the important features of aerial photography.
- c) Discuss in detail how GIS analysis is carried out.

**Q2)** Attempt any two of the following :

- a) What are the advantage of Remote Sensing as compaire to aerial photographic.
- b) Discuss the application of Remote Sensing in water resources.
- c) What are the principle of Remote Sensing? Differentiate between active and passive Remote Sensing.

**Q3)** Attempt any two of the following :

- a) Write in detail elements of aerial photos.
- b) An aerial photo having focal length (f) 5 inch. and height (h) 7000 ft. Calculate the scale of the aerial photo.
- c) "Aerial photography is important tool of Remote Sensing". Justify.

**Q4)** Write notes on any two of the following :

- a) Application of aerial photo.
- b) Nature of Remote Sensing.
- c) Elements of image interpretation.

**P.T.O.**

## SECTION - II

**Q5)** Attempt any two of the following :

- a) Discuss the role of GIS in environmental planning.
- b) Explain with example how GIS is useful in population studies.
- c) Discuss the important parameter to study GIS.

**Q6)** Attempt any two of the following :

- a) EMR is main component in Remote Sensing. Discuss.
- b) “Role of satellite in remote sensing study is very important”. Comment.
- c) Give various application of GIS.

**Q7)** Answer any two of the following :

- a) Development in Indian Remote Sensing. Explain.
- b) How do you manage the data with the help of GIS.
- c) Integration of GIS, remote sensing and aerial photography is essential in environmental studies. Comment

**Q8)** Write notes on any two of the following :

- a) Steps involved in image processing.
- b) Basic geometric characteristic of aerial photography.
- c) Drawbacks of GIS.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P870**

**[4035]-304**

**M.Sc. (Sem. - III)**

**ENVIRONMENTAL SCIENCE**

**ENV - 311 : Restoration Ecology**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

**Q1)** Attempt any two from the following :

- a) What are the measures for controlling the leachates from open cast mines?
- b) What is phytoremediation? Classify with their significance.
- c) What is the role of soil microflora in soil environment.

**Q2)** Solve any two from the following :

- a) Briefly explain the role of microorganism in restoration of hydrocarbon contaminated site.
- b) What are the basic steps of restoration of wet land ecosystem.
- c) What is the significance of rizosphere flora in heavy metal contaminant site.

**Q3)** Attempt any two from the following :

- a) What are the problems associated with waste dumping site.
- b) What are the guidalines for public participation in restoration programme.
- c) Explain the importance of mangrooves in coastal environment management.

**Q4)** Write short notes on any two of the following :

- a) Ecological sucesion.
- b) Root zone technology.
- c) Biotic and abiotic interaction.

***P.T.O.***

## SECTION - II

**Q5)** Attempt any two of the following :

- a) Discuss the physical parameter used in development of the watershed.
- b) Describe the procedure of co-operative lift irrigation.
- c) Discuss in short the procedure for resource appraisal.

**Q6)** Justify any two of the following :

- a) Organic farming is necessary for soil conservation measure.
- b) Gram-Panchayat can play an important role in watershed management.
- c) Area treatment is better option in water and soil conservation.

**Q7)** Explain any two of the following :

- a) Give an account on horticulture and pastureland.
- b) Discuss the hydrological characteristic of watershed.
- c) Explain how self-help groups for women can be a better social institution.

**Q8)** Write note on any two of the following :

- a) Role of exotics.
- b) Siluopastoral system.
- c) Watershed Development Committee.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P871**

**[4035]-305**

**M.Sc. (Sem. - III)**

**ENVIRONMENTAL SCIENCE**

**ENV - 312 : Biodiversity and Conservation**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *All questions are compulsory.*

**SECTION - I**

**Q1)** Attempt any two of the following : **[10]**

- a) What is need to monitor biodiversity.
- b) What are problems related with inbreeding.
- c) Explain endemism with example.

**Q2)** Write in brief any two of the following : **[10]**

- a) IUCN categories of species.
- b) Reasons for loss of Agrobiodiversity.
- c) Explain the factors causing ecosystem degradation.

**Q3)** Attempt any two of the following : **[10]**

- a) Describe the drivers and dynamics of changes in biodiversity.
- b) Explain scope of biodiversity science.
- c) What are problems related with introduced species? Give example.

**Q4)** Write short notes on any two of the following : **[10]**

- a) Levels of organisation in biodiversity.
- b) Functional properties of biodiversity.
- c) Capacity building.

**P.T.O.**

## SECTION - II

**Q5)** Attempt any two of the following : **[10]**

- a) What is biodiversity management? Mention the National Organizations primarily involved in framing policies and methodologies for biodiversity management.
- b) What is biodiversity legislation? Describe the international biodiversity law.
- c) Explain the tools and techniques of data collection and information management.

**Q6)** Attempt any two of the following : **[10]**

- a) Explain the role of biotechnology in biodiversity conservation.
- b) What are biodiversity values? Describe them briefly.
- c) Explain the necessity of biodiversity conservation. Add a note on current practices of conservation.

**Q7)** Write short notes on any two of the following : **[10]**

- a) CAB International.
- b) CITES.
- c) Ecosystem restoration.

**Q8)** Attempt any two of the following : **[10]**

- a) What are protected areas? Explain its necessity and role.
- b) Explain the role of universities and other educational institutions in biodiversity conservation.
- c) What is bioprospecting? Describe its role in exploration of biodiversity potential.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P872**

**[4035]-401**

**M.Sc. (Sem. - IV)**

**ENVIRONMENTAL SCIENCE**

**ENV - 401 : Environmental Toxicology, Health & Safety**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

**Q1)** Answer any two from the following : **[10]**

- a) Explain in detail the salient features of compensation act.
- b) What are the safety standards for hazardous waste treatment and disposal.
- c) What is the role of safety committees in safeguard implementation.

**Q2)** Attempt any two from the following : **[10]**

- a) Explain the measurement of toxicity studies. Add a note on Ame's test.
- b) Classify the toxic substances with suitable examples.
- c) What is importance of documentation in ISO-18000 programme.

**Q3)** Answer any two from the following : **[10]**

- a) Classify the pesticide. Add a note on chlorinated pesticide toxicity.
- b) What is carcinogenicity? Add a note on malignant stage in cancer.
- c) What are the duties of safety officer.

**Q4)** Write short note on any two : **[10]**

- a) On-site health programme in to industries.
- b) Environmental audit.
- c) LC 50.

**SECTION - II**

**Q5)** Answer any two of the following : **[10]**

- a) What are mitigation strategies for off site risk identification?
- b) Explain potential health risk involved in petroleum industry.
- c) Discuss in brief importance of National Health Policy in risk eradication.

**P.T.O.**

**Q6)** Answer any two of the following : **[10]**

- a) What are air emission standards for agrobased industry?
- b) Explain importance of UNEP in relation with Health Aspects.
- c) What are biological weapons? Explain with suitable example.

**Q7)** Answer any two of the following : **[10]**

- a) Explain role of Environmental Planning in urban development.
- b) Discuss role of NGO's in sanitation programs.
- c) Explain in brief current water and sanitation situation in Rural India.

**Q8)** Write short notes on any two : **[10]**

- a) Functions of WHO.
- b) Pulse polio.
- c) Air borne viral diseases.





Total No. of Questions : 8]

[Total No. of Pages : 2

**P873**

**[4035]-402**

**M.Sc. (Sem. - IV)**

**ENVIRONMENTAL SCIENCE**

**ENV - 402 : Watershed Management**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) All questions carry equal marks.*
- 4) All questions are compulsory.*

**SECTION - I**

**Q1)** Attempt any two from the following :

- a) What are the objectives of watershed management?
- b) Explain the process of delineation of watershed.
- c) What are the characteristics of land classes?

**Q2)** Answer any two of the following :

- a) What are the guidelines for water resource appraisal?
- b) "Watershed planning is essential for landuse planning and soil conservation". Discuss.
- c) Write a note on monitoring parameters in watershed planning.

**Q3)** Attempt any two from the following :

- a) "Success of watershed management is depends upon active participation of people". Justify.
- b) Explain the various hydrological process in watershed study.
- c) Explain the process of plan formulation and implementation in watershed planning.

**Q4)** Write short notes on any two of the following :

- a) Scheme of land capability classification.
- b) Watershed survey.
- c) Management alternatives in watershed planning.

**P.T.O.**

## SECTION - II

**Q5)** Answer any two of the following :

- a) Explain various factors involved in wind erosion.
- b) State the role of strip cropping and mulching in conservation for aerable land.
- c) Write various methods of estimation of water erosion.

**Q6)** Justify the following statement any two :

- a) Rehabilitation of mined land is a conservation measure.
- b) Vegetative waterways is a conservation measure for aerable land.
- c) Conservation horticulture is useful in soil erosion.

**Q7)** Answer any two of the following :

- a) Describe the benefits of agro-forestry.
- b) Discuss any two methods of water harvesting.
- c) What are the ecosystem management challenges.

**Q8)** Write notes on any two of the following :

- a) Graded bunds.
- b) Reclamation of ravine land.
- c) Storage of harvested water.
- d) Evaluation of self help group.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P874**

**[4035]-403**

**M.Sc. (Sem. - IV)**

**ENVIRONMENTAL SCIENCE**

**ENV - 411 : Forestry and Habitat Management**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) All questions carry equal marks.*
- 3) Answers to the two sections should be written in separate answer books.*
- 4) Neat diagrams must be draw wherever necessary.*

**SECTION - I**

**Q1)** Answer any two of the following : **[10]**

- a) Define ethnobotany. Explain the role of ethnobotany.
- b) What is nutrient recycling? Describe the nutrient recycling in forest ecosystem.
- c) Describe the general silvicultural principles.

**Q2)** Attempt any two of the following : **[10]**

- a) What is Agroforestry? Explain the scope and objectives.
- b) Explain-how employment is generated through various components of social forestry.
- c) What is Tribology? Explain the cultural, traditional, customs and ethos.

**Q3)** Attempt any two of the following : **[10]**

- a) What are the silvicultural systems? Explain wood selection and felling.
- b) Explain the methods and techniques of free improvement.
- c) Describe the participatory approach in joint forest management.

**Q4)** Write a note on any two : **[10]**

- a) Forest productivity.
- b) In-situ and Ex-situ conservation.
- c) Impacts of mining, construction and development projects on forestry.

**P.T.O.**

**SECTION - II**

- Q5)** Answer any two from the following : **[10]**
- a) Mention the role of private sector in forest management.
  - b) Discuss the need of wood seasoning.
  - c) Explain various measures employed against forest fire.
- Q6)** Justify the statement (any two) : **[10]**
- a) Sampling is crucial step in forest management.
  - b) Forest policies are influenced by industrial policies.
  - c) Forest acts in India are timely ammended.
- Q7)** Answer the following questions (any two) : **[10]**
- a) Elaborate on the history of forest development in India.
  - b) Discuss the merits and demerits of Joint Forest Management.
  - c) What are storage facilities for the forest products? Support the answer with suitable examples.
- Q8)** Write notes on (any two) : **[10]**
- a) Forest conservation act, 1980.
  - b) Natural disasters and forest resources.
  - c) Non timber forest produce.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P875**

**[4035]-404**

**M.Sc. (Sem. - IV)**

**ENVIRONMENTAL SCIENCE**

**ENV - 412 : Environmental Planning & Management**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) All questions carry equal marks.*
- 4) All questions are compulsory.*

**SECTION - I**

**Q1)** Attempt any two of the following :

- a) What is planning? Give its important in developmental project.
- b) How does historical background of plan in any developmental project?
- c) Write in brief importance of baseline status of any one resource in planning.

**Q2)** Attempt any two of the following :

- a) Population explosion is obstacle in development. Justify the statement.
- b) Define environmental planning and add a note on advantage of planning development.
- c) Rehabilitation and resettlement are important issues of planning. Comment on the statement.

**Q3)** Solve any two of the following :

- a) "Environmental planning play important role in development". Justify the statement.
- b) Write in brief the various parameter required in urban planning.
- c) "Willingness play important role in planning". Discuss the statement.

**Q4)** Write notes on any two of the following :

- a) Urban planning.
- b) Development Indices.
- c) Adverse impact of planning.

***P.T.O.***

## SECTION - II

**Q5)** Answer any two of the following :

- a) “Environment and development are two side of same coin”. Justify the statement.
- b) “EIA is essential tool of planning for development”. Comment.
- c) Enlist the Indian law for protection of environment.

**Q6)** Attempt any two of the following :

- a) What is solid waste? How you can plan for its disposal.
- b) “Biomedical waste doesn’t require planning for its disposal”. Justify.
- c) “State pollution control boards play important role in protection of environment”. Comment the statement.

**Q7)** Answer any two of the following :

- a) What is development? Write in brief environmental parameters considered for it.
- b) What is conservation? Discuss the methods of conservation.
- c) Why sustainable development is important for mankind? Explain.

**Q8)** Write short notes on any two of the following :

- a) Environment Protection Acts in India.
- b) National policies for environment.
- c) Exploitation and safeguard of environment.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P876**

**[4035]-405**

**M.Sc. (Sem. - IV)**

**ENVIRONMENTAL SCIENCE**

**ENV - 413 : Environmental Management Systems**

**(Theory & Job Licensing)**

**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) All questions carry equal marks.*
- 4) All questions are compulsory.*

**SECTION - I**

**Q1)** Answer any two of the following :

- a) Define environmental management. How does it help in achieving sustainable development?
- b) Write about the various tools of environmental management.
- c) What is ISO and ISO standards? What is the difference between ISO 9000 & ISO 14000 standards?

**Q2)** Attempt any two of the following :

- a) What are the different stages in product LCA? Explain with a case study.
- b) Write about the different applications of LCA.
- c) Describe the principles of green building.

**Q3)** Answer any two of the following :

- a) Elaborate about the core elements of Environmental Management system. What is the significance of environmental policy.
- b) What are the three components of EMS conforming to ISO 14001?
- c) Write about the goals and purposes of EMS.

**Q4)** Write short notes on any two :

- a) Carrying capacity.
- b) Benefits of Environmental Design.
- c) Functional unit in LCA.

***P.T.O.***

## SECTION - II

**Q5)** Answer any two of the following :

- a) What is solid waste management? Write about the different factors affecting a solid waste management system.
- b) What are the components of municipal solid waste? How does income affect its composition?
- c) What are the different environmental effects of solid waste?

**Q6)** Attempt any two of the following :

- a) Discuss the different aspects of collection of solid waste.
- b) Write a note of volume and size reduction of solid waste.
- c) Explain the structure of sanitary landfill with a schematic diagram.

**Q7)** Answer any two of the following :

- a) Write about the different technologies of incineration.
- b) How are hazardous wastes identified and classified?
- c) Explain the significance of 3R principle in solid waste management.

**Q8)** Write short notes on any two :

- a) Agricultural wastes.
- b) Vermicomposting.
- c) Pyrolysis.

