PAPER-III
ENVIRONMENTAL SCIENCES

Signature and Name of Invigilator

1. (Signature) __________________________
   (Name) ____________________________
   Roll No. ____________________________

2. (Signature) __________________________
   (Name) ____________________________
   Roll No. ____________________________

Time : 2 1/2 hours

[Maximum Marks : 200]

Number of Pages in this Booklet : 32

Number of Questions in this Booklet : 19

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. Answer to short answer/essay type questions are to be given in the space provided below each question or after the questions in the Text Booklet itself.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal and do not accept an open booklet.
   (ii) Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
4. Read instructions given inside carefully.
5. One page is attached for Rough Work at the end of the booklet before the Evaluation Sheet.
6. If you write your name or put any mark on any part of the Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
7. You have to return the test booklet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall.
8. Use only Blue/Black Ball point pen.
9. Use of any calculator or log table etc., is prohibited.

P.T.O.
ENVIRONMENTAL SCIENCE
PAPER – III

Note: This paper is of two hundred (200) marks containing four (4) sections. Candidates are required to attempt the questions contained in these sections according to the detailed instructions given therein.
SECTION – I

Note: This section consists of two essay type questions of twenty (20) marks each, to be answered in about five hundred (500) words each. (2 × 20 = 40 marks)

1. Municipal solid waste management.

   OR

   Environmental problems associated with megathermal power plants.

   OR

   Ground water provinces of India.

   OR

   Agro-climatic regions of India.

   OR

   Biodiversity and climate change.

   OR

   Biodegradation of plant biomass.
2. Wetland Conservation.
   
   OR
   Clean Development Mechanism (CDM) and Environmental protection.
   
   OR
   The types, sources and consequences of water pollution.
   
   OR
   Soil bioremediation – An emerging technology.
   
   OR
   An ecosystem, its structure and functions.
   
   OR
   Environmental Impacts of thermochemical and photochemical reactions in atmosphere.
SECTION – II

Note : This section contains three (3) questions of fifteen marks each to be answered in about three hundred (300) words. (3 × 15 = 45 marks)

3. Describe the effects of Cd, Hg and As contamination on soil health.

4. How does an electrostatic precipitator (ESP) remove particles from flue gases? On what factors the efficiency of ESP depends?

5. Write about the constitutional provisions pertaining to environment.
SECTION – III

Note: This section contains nine (9) questions of ten (10) marks, each to be answered in about fifty (50) words. (9 × 10 = 90 marks)

6. What is redox potential? Discuss its significance.

7. Write about chemical reactions leading to ozone depletion.
8. Differentiate between autochthonous and an allochthonous bacteria.
9. What are the essential components of a rain water harvesting system?

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11. What are five-R policies for waste minimization?

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12. What is meant by a ‘genetically engineered’ bacterium? How is this accomplished?
13. How does a solar photovoltaic (PV) cell work? On what factors its efficiency depends?
14. Write down the equation governing the concentration of pollutants in a Gaussian plume dispersion model.

SECTION – IV

Note: This section contains five (5) questions of five (5) marks each based on the following passage. Each question should be answered in about thirty (30) words.

\( (5 \times 5 = 25 \text{ marks}) \)

Around 1960, Lake Erie was declared dead, its DO decreased in deeper layer of water, its surface almost covered by overgrowth of algae, and some of its predators became...
endangered. Investigations were carried out by many scientists, who concluded that the major cause of the destruction of the Lake Erie ecosystem was too much phosphorous from municipal waste. In order to overcome the problems of Lake Erie, it was thought that there should be a strong cooperation between USA and Canada. The International Joint Commission was established and the governments of the two countries worked together for improving waste treatment in communities surrounding Lake Erie. By 1985, the annual release of phosphorous from these sources reduced by 84% and the phosphorus levels in the Detroit River, which feeds Lake Erie, was reduced by 65%. As the water quality improved with phosphorous abatement, algal growth declined and oxygen levels improved. The small planktonic crustaceans that feed on the algae became less abundant and fishes, such as undesirable alewife and shiner, that feed on them, also decreased. By 1991, the total phosphorous level in Lake Erie was reduced to a level very close to the permissible level. The decline in algal population resulted in the improvement of water clarity in the Lake. Moreover, the decline in algal population has also been achieved by invading zebra mussels in Lake Erie.

Answer the following questions:

15. How does phosphorous enrichment of water body cause algal growth?
16. How did the process of eutrophication in Lake Erie lead to oxygen depletion?

17. How the invasion of zebra mussels will affect the ecology of Lake Erie?
18. What was the institutional mechanism set up to address the problems of Lake Erie?
19. What were the positive results due to the institutional intervention?
Space For Rough Work
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Total Marks Obtained (in words) ...........................................
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(Evaluation) Date ................................