

**2025**  
**ENVIRONMENTAL SCIENCE**  
**Semester-IV**  
**GEST: 42**  
**Full Marks: 40**  
**Duration: 2 hours**

*Candidates are required to give their answers in their own words as far as practicable.*

*Answer any 8 questions selecting 4 from each unit.*

**Unit-1**

**Environmental Statistics and Modelling**

1. Why 'statistical methods' are important in environmental studies? Give reasons. 5
2. State the principal characteristics of a 'normal distribution'. 5
3. For a sample size of 250 with mean = 23.45 and standard deviation = 10.25, estimate the population mean at 99.7% probability. 5
4. Test whether the 'mean' of species diversity figures of two biomes A and B are significantly different or not, given –  
Biome -A: Mean = 500, SD = 120, Sample Size = 50  
Biome-B: Mean = 480, SD = 100mm, Sample Size = 40  
Given ,  
Critical  $t_{\alpha=0.001}$  (df = 88) = 2.634 5
5. Plot the following data (Scatter Diagram/ Plot), and draw a regression line by 'least squares method' on it and comment. 5

Grassland (sq.km)	25	38	50	68	47	83	91	87	59	94
No. of Deers	260	220	250	310	305	300	350	275	280	350

**Unit-2**

**Molecular Biology and Bioinformatics**

6. What is known as "end replication problem"? Explain the role of telomerase in "end replication problem"? What is the difference between leading strand and lagging strand? 1+2+2 = 5
7. Explain "consensus" and "conserved" sequence in prokaryotic promoters. If you mutate the **-10 (TATAAT) or -35 (TTGACA) region** of a bacterial promoter, how would you experimentally measure its effect on transcription? What is the role of the sigma factor in transcription? 2+2+1 = 5
8. How would DNA replication be affected if a mutation occurred in the DnaA binding sites at the OriC region? Would replication still initiate? Why or why not? Why is the lagging strand synthesized discontinuously? Why do Replication origins consist of AT-rich sequences? 2+2+1 = 5
9. Name the enzyme:
  - a. That unwinds the double-stranded DNA at the replication fork using ATP.
  - b. That relieves torsional strain and prevents super coiling ahead the replication fork.
  - c. That links Okazaki fragments on the lagging strand.
  - d. That initiates DNA replication by synthesizing short RNA primers.

Which protein forms a clamp that holds DNA polymerase onto the template strand? 4+1 = 5

**P.T.O**

10. What is the biological significance of an E-value in BLAST, and what does a low E-value indicate? Why is MSA preferred over pairwise alignment when studying protein families? Why is it useful to retrieve both nucleotide and protein sequences of a gene? Why is it important to retrieve the CDS rather than genomic DNA when expressing a gene in another organism? 2+1+1+1 = 5