AT–343

B.Sc. (Part–II) Semester–III Examination

3S : BIOTECHNOLOGY (R/V)

(Essential Mathematical, Biostatistics, Bioinformatics and Biophysical Methods)

Time : Three Hours] [Maximum Marks : 80

Note :— (1) All questions are compulsory.

(2) Draw well labelled diagrams wherever necessary.

1. (A) Fill in the blanks :

(i) A set which does not contain any element is called _____ set.

(ii) Genbank is _____ nucleotide sequence database.

(iii) _____ resist the change in pH.

(iv) The average of the upper and lower limits of a class is known as _____. 2

(B) Choose correct alternative :

(i) Shoe size of most of the people in India is No. 7. Which measure of central value does it represent ?

(a) Mean (b) Second Quartile

(c) Media (d) Mode

(ii) Which of the following is not a primary nucleic acid database ?

(a) Genbank (b) DDBI

(c) TrEMBL (d) EMBL

(iii) Complement of empty set is :

(a) Null set (b) Universal set

(c) Empty set (d) Finite set

(iv) Under which circumstances would a reaction be non-spontaneous at all temperatures ?

(a) ΔH° negative and ΔS° positive

(b) ΔH° negative and ΔS° negative

(c) ΔH° positive and ΔS° negative

(d) ΔH° positive and ΔS° positive 2

(C) Answer in one statement :

(i) Half-life of radioactive elements.

(ii) Composite databases.

(iii) Binomial Equation.

(iv) Purposive sampling. 4

2. Answer the following :

(a) In a class of 35 students, 24 like to play cricket and 16 like to play football. Also each student likes to play at least one of the two games. How many students like to play both cricket and football ? 4

(b) Expand $\left[x^2 + \frac{3}{4}\right]^4$, $x \neq 0$ using binomial theorem. 4

(c) A stone is dropped into a quiet lake and waves move in circles at a speed of 4 cm/sec. At the instant, when the radius of the circular wave is 10 cm, how fast is the enclosed area increasing ? 4

OR

(p) Find the integral of $\int\left(x^{\frac{2}{3}} + 1\right)dx$ 4

(q) Evaluate $\lim_{x \to 0} \frac{\sqrt{1+x} - 1}{x}$ 4

(r) In a survey of 400 students in a school 100 were listed as taking apple juice and 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many students were taking neither apple juice nor orange juice. 4

3. What is sampling ? Describe the different types of sampling in detail. 12

OR

One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely, calculate the probability that the card will be :

(i) a diamond

(ii) not an ace

(iii) not a diamond

(iv) not a black card 12

4. Attempt the following :

(a) Describe ANOVA. 4

(b) Explain mean deviation. 4

(c) Explain calculation of mean of grouped and ungrouped data. 4

OR

(p) Test of significance. 4

(q) Standard deviation. 4

(r) Explain calculation of mode and median of ungrouped data. 4

5. Explain the following :

(a) Blood buffers. 4

(b) Henderson-Hasselbalch equation. 4

(c) Any one nuclear model. 4

OR

(p) Role of radioactivity in biology. 4

(q) Nuclear radiations and their properties. 4

(r) pH changes in buffer. 4

6. Describe :

(a) Half cell potential. 4

(b) Gibbs free energy. 4

(c) Bioenergetics of mitochondria. 4

OR

(p) Chemical potential. 4

(q) Bioenergetics of chloroplast. 4

(r) Enthalpy and Entropy. 4

7. Define Bioinformatics. Explain goal, scope and limitations of Bioinformatics. 12

OR

What are databases ? Describe primary, secondary, composite and structural databases. 12