AS–1419

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

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 consists of a definite number of elements is called _____ set.

   (ii) PROSITE is _____ database.

   (iii) If 5 is subtracted from each observation, then the mean of the observation is reduced by _____.

   (iv) If a compound has a pH of 6.5 it has a pOH of _____.   2

   (B) Choose correct alternative :

   (i)   Entrez, a search engine used to search across databases is maintained by :

      (a) EBI   (b) SBI

      (c) NCBI   (d) Sanger Institute

   (ii) Buffers keep the pH of a solution from changing by :

      (a) Converting strong acids to weak ones

      (b) Converting weak acids to strong ones

      (c) Converting weak bases to strong ones

      (d) None of these

   (iii) If the grouped data has open-end classes, one cannot calculate :

      (a) Median   (b) Mode

      (c) Mean   (d) Quartile

   (iv) Complement of Universal set is :

      (a) Empty set   (b) Universal set

      (c) Finite set   (d) Infinite set   2

(C) Answer in **one** statement :

    (i)   Law of conservation of Energy

    (ii)   Secondary database

    (iii) Union of set

    (iv) Range.   4

2.   Answer the following :

    (a)   Let $U = \{1, 2, 3, 4, 5, 6\}$, $A = \{2, 3\}$ and $B = \{3, 4, 5\}$. Find A', B', $A' \cap B'$, $A \cup B$.   4

    (b)   Compute $(98)^5$ by using binomial theorem.   4

    (c)   Evaluate $\displaystyle \lim_{x \to 1} \frac{x^{15} - 1}{x^{10} - 1}$.   4

OR

    (p)   Find the rate of change of the area of a circle per second with respect to its radius r when r = 5 cm.   4

    (q)   Find the anti derivative F of f defined by $f(x) = 4x^3 - 6$, where $F(0) = 3$.   4

    (r)   In a school there are 20 teachers who teach Mathematics or Physics. Of these 12 teach Mathematics and 4 teach both Physics and Mathematics. How many teach Physics ?   4

3.   Describe the following :

    (a)   Purposive sampling with an example.   4

    (b)   Axioms of probability.   4

    (c)   Random sampling with an example.   4

OR

    (p)   Stratified sampling with an example.   4

    (q)   Additive rule of probability.   4

    (r)   Multiplicative rule of probability.   4

4. Explain the following :

   (a) Any one test of significance.   4

   (b) Measures of deviation.   4

   (c) Mode and Median of ungrouped data.   4

OR

   (p) ANOVA.   4

   (q) Mean deviation and standard deviation.   4

   (r) Mean calculation of grouped and ungrouped data.   4

5. What are buffers ? How do they resist the change in pH and explain blood buffer ?   12

OR

Explain the properties of nucleus and describe in detail nuclear models.   12

6. State three laws of thermodynamics and explain the effect of standard free energy change on state of reaction.   12

OR

Describe in detail structure and bioenergetics of chloroplast.   12

7. Explain the following :

   (a) Any two applications of Bioinformatics.   4

   (b) Structural databases.   4

   (c) Define Bioinformatics and give its limitations.   4

OR

   (p) Composite databases.   4

   (q) Information retrieval from NCBI.   4

   (r) Goal and scope of Bioinformatics.   4