REV-01
BBT/01/05

2024/07

SET A

B.Sc. BIOTECHNOLOGY
FIFTH SEMESTER [SPECIAL REPEAT]
BIOINFORMATICS & BIOSTATISTICS
BBT-504

[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 mins. **Marks: 20**

Choose the correct answer from the following: ***1×20=20***

1. The first definition of the term bioinformatics was coined by Paulien Hogeweg and Ben Hesper in the year:
   a. 1069 b. 1965
   c. 1970 d. 1973
2. Following is an example of primary nucleotide database:
   a. PIR b. DDBJ
   c. PDB d. OMIM
3. GenBank is part of the International Nucleotide Sequence Database Collaboration (INSDC) which is a joint effort between:
   a. GenBank b. DDBJ
   c. EMBL d. All of the above
4. The limit of sequence ID in a FASTA definition line is upto:
   a. 25 characters b. 20 characters
   c. 15 characters d. 10 characters
5. The 3D structures in PDB are obtained typically by:
   a. X-ray crystallography b. NMR spectroscopy
   c. Cryoelectron microscopy d. All of the above
6. Global alignment uses:
   a. Two sequences of same length b. Two closely related sequences
   c. Needleman-Wunch algorithm d. All of the above
7. The suitable substitution matrix to align closely related sequences is:
   a. PAM 250 or BLOSUM 80 b. PAM 40 or BLOSUM 80
   c. PAM 120 or BLOSUM 40 d. PAM 250 or BLOSUM 40
8. Lower the value of PAM:
   a. Lower the sequence identity b. Higher the sequence identity
   c. Sequences are distantly related d. None of the above
9. In 2D-PAGE, following is used as a reducing reagent:
   a. DTT b. SDS
   c. β-mercaptoethanol d. None of these
10. The chromosome with highest gene density in human is:
    a. Chromosome 21 b. Chromosome 17
    c. Chromosome 19 d. Chromosome 18

11. The following is an example of a docking software:
    a. TarFishDock
    b. OpenBabel
    c. FlexX
    d. None of these

12. Which of the following is an example of all alpha domain?
    a. Helix-turn-helix motif
    b. Coiled coil structure
    c. Leucine zipper
    d. All of the above

13. The events A = Head is obtained in the first toss of a fair coin and B = Head is obtained in the second toss of the same coin:
    a. Exhaustive
    b. Mutually exclusive
    c. Independent
    d. Dependent

14. Which of the following measures can be calculated in case of open-end class?
    a. Median
    b. Standard deviation
    c. Mean
    d. None of the above

15. Which of the following measure is affected by the extreme values?
    a. Standard deviation
    b. Quartile deviation
    c. Mean deviation about median
    d. None of the above

16. In a Poisson distribution with parameter = 3 then the mean is:
    a. 9
    b. $\sqrt{3}$
    c. 3
    d. None of the above

17. The chances of occurrence of error in an experiment, is an example of:
    a. Binomial distribution
    b. Poisson distribution
    c. Normal distribution
    d. None of the above

18. Which of the following is a type-II error?
    a. Null hypothesis is rejected when it is not true
    b. Null hypothesis is not rejected when it is not true
    c. Null hypothesis is rejected when it is true
    d. Null hypothesis is rejected when it is not true

19. If the calculated value of the test statistic is greater than its critical value, then:
    a. The null hypothesis is rejected
    b. The null hypothesis is not rejected
    c. No conclusion
    d. None of the above

20. If $r_{X,Y} = \pm 1$, then X and Y are:
    a. Perfectly correlated
    b. The two regression lines coincide
    c. Either a or b
    d. Both a and b

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Descriptive

Time : 2 hr. 30 mins. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. What is Ramachandran plot? Explain in detail "Rational Drug Designing". 2+8=10

2. What are Biological databases? Explain nucleic acid database, genome database, protein sequence database, structure database and gene expression database with the help of examples. 2+8=10

3. Explain the major genome features of: 5+5=10
   a) Human
   b) *Arabidopsis*

4. a) Explain Type-I error and Type-II error. Which one is more harmful? 5+5=10
   b) The following table gives the number of accidents that occurred during the seven days in a week. Find at 5% level of significance, whether the accidents are uniformly distributed over the week.

Days	: Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents:	14	18	12	11	15	14

   [Given, the critical value of χ^2 at 5% level of significance and 5 degree of freedom is 11.07]

5. a) Explain dynamic programming method with the help of given sequences. 5+5=10
   Seq 1: ATTGC match=1
   Seq 2: AGGC mismatch=0
   b) Explain 2D-Gel electrophoresis through resolution and reduction.

6. Find mean, median, mode, standard deviation and coefficient of variation for the following distribution: 10

Heights (feet)	:5.0 – 5.3	5.3 – 5.6	5.6 – 5.9	5.9 – 6.2
Number of : students	7	8	12	3

7. a) Write the assumptions of Binomial distribution. 5+5=10
   b) If the heights of 500 students are normally distributed with mean 68.0 inches and standard deviation 3.0 inches, how many students have height between 65 and 71 inches.
   [Given, Z= 1.00 1.33
   A = 0.8413 0.9082]

8. Differentiate between: 5+5=10
   a) Local and Global alignment
   b) Pairwise and multiple sequence alignment

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