No. of Printed Pages : 5

RBC-002

Ph.D. IN BIOCHEMISTRY (PHDBC)

00691

Term-End Examination

June, 2019

RBC-002 : BIOSTATISTICS AND BIOINFORMATICS

Time : 3 hours *Maximum Marks : 100*

Note : *This question paper consists of* ***two*** *sections; Section A and Section B. Answer both the sections. Calculators are allowed.*

SECTION A

1. Match the following : 5

	Group A		*Group B*
(i)	Utility tool	a.	NCBI
(ii)	RCSB	b.	Linux
(iii)	e-Resource	c.	Adobe Photoshop
(iv)	2° structure	d.	Protein Structure
(v)	Operating system	e.	Chou-Fasman

2. Define the following terms with examples : $2 \times 2\frac{1}{2} = 5$

   (a) Binary numbers

   (b) Node in evolutionary tree

3. Distinguish between the following with suitable example (if any) : $4 \times 2\frac{1}{2} = 10$

   (a) t-test and z-test

   (b) Rooted and Unrooted phylogeny

   (c) LAN and WAN

   (d) Mean and Median

SECTION B

*Answer any **eight** of the following :*

4. (a) Draw a suitable diagram to represent the monthly expenditure of a family over different budget heads as given below :

Item	*Expenditure (in hundreds)*
Food	25
Clothing	15
Education	20
Transport	10
Outing	10
Misc.	05
Saving	15
Total	100

(b) Distinguish between primary and secondary data with suitable example. *6+4=10*

5. The monthly income (in thousand rupees) of five employees in a company are as follows :

25, 20, 30, 15, 10.

(i) List all possible simple random samples (without replacement) of size 2.

(ii) Calculate the mean of all selected samples and set up sampling distribution of the sample mean. *10*

6. For two firms A and B, belonging to the same industry, the following details are available :

	Firm A	*Firm B*
Number of Employees	100	200
Average Weekly Wage	₹ 2,400	₹ 1,700
Standard Deviation of Wages	₹ 6	₹ 8

Find the average weekly wages and standard deviation of the wages of all employees of both the firms. *10*

7. The two lines of regression are given by $3x + 12y = 19$ and $3y + 9x = 46$. Find (i) mean values of x and y, (ii) the values of regression coefficients, and (iii) the value of correlation coefficient. *3+4+3*

8. The following table gives the classification of 300 products according to types of machines and material used to produce these products :

Machine	Material		
	A	B	C
M_1	30	10	40
M_2	40	20	40
M_3	50	30	40

Test whether the machines and materials used are independent at 5% level of significance.

[Given that χ^2_4 (0·05) = 9·49, χ^2_8(0·05) = 15·51] *10*

9. What is a biological database ? Explain various types of databases along with suitable examples. *3+7*

10. What is the significance of sequence alignment ? Explain how substitution scores and gap-penalties play a vital role in this process. *4+6*

11. What is phylogeny ? Distinguish between cladograms and phylograms. Explain the steps involved in constructing a phylogenetic tree. *3+3+4*

12. What is propensity value ? Explain how Chou-Fasman rules are helpful in protein secondary structure prediction. *3+7*

13. A researcher wants to know the genetic closeness of "Peptidase-A" among the following species :

    (i) *Homo sapiens*

    (ii) *Sus scrofa*

    (iii) *Bos taurus*

    (iv) *Mus caroli*

    Explain the steps involved in establishing genetic closeness using "Clustal Omega" as a research tool. *10*
