

## FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2019

(CUCBCSS-UG)

Microbiology

MBY 4C 15-BIOSTATISTICS – II

Time : Three Hours

Maximum : 64 Marks

*Use of calculator is permitted.***Part A***Answer all questions.**Each question carries ½ mark.**Fill in the blanks (Questions 1 – 4) :*

1. Hypothesis which specifies the population completely is known as \_\_\_\_\_.
2. The technique of ANOVA was developed by \_\_\_\_\_.
3. Range of Spearman rank correlation co-efficient is \_\_\_\_\_.
4. Critical value for 5% level of significance under one tailed normal test is \_\_\_\_\_.

*Choose the correct answer (Questions 5 – 8) :*

5. If the correlation between X and Y is 0.4, the correlation between  $2X + 3$  and Y is :  
(a) 0.8. (b) 0.2.  
(c) 0.7 (d) 0.4.
6. Regression co-efficient is independent of :  
(a) Origin. (b) Scale.  
(c) Both origin and scale. (d) Neither origin nor scale.
7. If  $5X - 3Y + 4 = 0$  is the regression line of X on Y, then regression co-efficient is :  
(a)  $-\frac{5}{3}$ . (b)  $\frac{5}{3}$ .  
(c) 0.6. (d) - 0.6.
8. ANOVA utilizes :  
(a) Chi-square test. (b) F-test.  
(c) Normal test. (d) t-test.

**Turn over**

State True or false (Question 9 – 12) :

9. Regression lines are perpendicular to each other if the variables are uncorrelated.
10. Mean sum of squares is obtained by dividing the sum of squares by the degrees of freedom.
11. Scatter diagram is a graphical method of studying regression.
12. Multiple correlation co-efficient lies between 0 and 1.

(12 × ½ = 6)

### Part B (Short Answer Type Questions)

*Answer all questions.  
Each question carries 2 marks.*

13. Define null and alternative hypotheses.
14. State the basic assumptions in ANOVA technique.
15. How can a decision about one tailed and two tailed tests be taken ?
16. What are regression co-efficients ?
17. Write down the formula for partial correlation co-efficient in terms of simple correlation co-efficients.
18. Give any two applications of chi-square distribution.
19. Give the Spearman's rank correlation co-efficient.
20. Define ANOVA and give its use.
21. Define Attributes. What is contingency table ?
22. What is scatter diagram ?

(10 × 2 = 20 marks)

### Part C (Short Essays)

*Answer any six questions.  
Each question carries 3 marks.*

23. Define (i) critical region ; (ii) Type I and Type II errors ; and (iii) power of a test.
24. Explain Chi-square test for goodness of fit.
25. Define Karl Pearson correlation co-efficient. How correlation co-efficient affects when scale of origin and scale are made ?
26. Give the meaning of regression. Why there two regression lines in a bivariate distribution ?
27. Describe the test for significance of population correlation co-efficient.

28. Complete the following ANOVA table :

Source of variation	Sum of squares	Degrees of freedom	Mean sum of squares
Between columns	42	3	—
Between rows	—	—	16
Error	136	6	—
Total	210	—	

29. Explain multiple correlation co-efficient. Explain its use with an example.

30. Given the following data:

$\bar{X} = 36$ ,  $\bar{Y} = 85$ ,  $\sigma_x = 11$ ,  $\sigma_y = 8$ ,  $r_{xy} = 0.66$ . Find the two regression equations. Estimate the value of X when Y = 75.

(6 × 3 = 18 marks)

#### Part D (Essays)

Answer any **two** questions.  
Each question carries 10 marks.

31. (i) State the procedure followed in testing a statistical hypothesis.
- (ii) Describe chi-square test for independence of attributes.
- (iii) A certain drug was administered to 456 persons out of a total of 720 in a certain locality to test its efficacy against typhoid. The incidence of typhoid is shown below. Find out the effectiveness of the drug against the disease :

	Infection	No Infection	Total
Administering the drug	144	312	456
Without Administering the drug	192	72	264
Total	336	384	720

(Given  $\chi^2_{0.05}$  for degrees of freedom 1, 2, 3 and 4 are respectively 3.84, 5.99, 7.81 and 9.48).

**Turn over**

32. (i) In a trivariate distribution,  $r_{12} = 0.6$ ,  $r_{23} = r_{13} = 0.8$ , find  $r_{23.1}$  and  $R_{1.23}$ .
- (ii) Describe the technique of ANOVA with an illustration for two way classification model.
33. (i) Distinguish giving suitable examples between :
- (a) positive and negative correlations ; and (b) linear and non-linear correlations.
- (ii) Given the two regression equations :
- $$4X - 5Y + 8 = 0 \text{ and } 20X - 9Y - 24 = 0.$$
- Find the mean values of X and Y.
- (iii) The co-efficient of rank correlation of the marks obtained by 10 students in Statistics and Accountancy was found to be 0.2. It was later discovered that the difference in ranks of two subjects obtained by one of the student was wrongly written as 9 instead of 7. Find the correct value of rank correlation co-efficient.

(2 × 10 = 20 marks)