

C 62603

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Name.....

Reg. No.....

**SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2019**

(CUCBCSS—UG)

Microbiology

MBG 2C 04—BIOSTATISTICS—II

(2018 Admissions)

Time : Three Hours

Maximum : 80 Marks

*Use of calculator is permitted.*

**Section A**

*Answer all questions in one word each.*

*Each question carries ½ marks.*

1. Probability of first kind error is called the \_\_\_\_\_ of the test.
2. Power of a test is related to \_\_\_\_\_.
3. The allocation of treatments units with equal probability is known as \_\_\_\_\_.
4. Visual representation of a bivariate data is known as \_\_\_\_\_.
5. If  $r = 1$ , the relationship between  $b_{yx}$  and  $b_{xy}$  is \_\_\_\_\_.
6. The range of Pearson's co-efficient of correlation is \_\_\_\_\_.
7. Partial regression co-efficient is lying between \_\_\_\_\_.

*Write True or False :*

8. Correlation between age and sex of a group of Students is 1.89.
9. If X and Y are independent, the value of regression co-efficient  $b_{yx}$  is equal to one.
10. Power of a test is equal to  $1 - P$  [Type 1 error].
11. In a completely randomized design with  $t$  treatments and  $n$  experimental units, error degrees of freedom is equal to  $n - t$ .
12. In analysis of variance, the total variance splitted into component variances.

(12 × ½ = 6 marks)

**Section B**

*Answer all questions.*

*Each question carries 2 marks.*

13. Define size of test.
14. Define alternative hypothesis.

Turn over

15. Explain independence of attributes.
16. What is the principle of least squares ?
17. Write down the model for two way ANOVA.
18. Give necessary and sufficient condition for the regression planes,  $X_1$  on  $X_2$  and  $X_3$ ;  $X_2$  on  $X_1$  and  $X_3$  and  $X_3$  on  $X_1$  and  $X_2$  to be coincident.
19. What is contingency table ?
20. Given the regression lines  $X + 2Y = 5$  and  $2X + 3Y = 8$  and  $\sigma_y^2 = 4$ , find the value of  $\sigma_x^2$  ?
21. Discuss the type of errors in testing of hypothesis.
22. Outline the conditions for the validity of  $\chi^2$  test.

(10 × 2 = 20 marks)

### Section C

*Answer any six questions.  
Each question carries 5 marks.*

23. Give the formula for calculating Statistic  $\chi^2$  in case of Contingency table of order 2\*2.
24. The following measurements show the respective heights in inches of ten fathers and their eldest sons,

|            |   |    |    |    |    |    |    |    |    |    |    |
|------------|---|----|----|----|----|----|----|----|----|----|----|
| Father (X) | : | 67 | 63 | 66 | 71 | 69 | 62 | 62 | 70 | 61 | 72 |
| Son (Y)    | : | 68 | 66 | 65 | 70 | 69 | 67 | 64 | 71 | 60 | 63 |

Find the regression line of Son's height on Father's height.

25. What is rank correlation? How would you tackle the situation when ranks are equal?
26. From the following regression equations, find the mean values of X and Y series
 
$$8X - 10Y = -66$$

$$40X - 18Y = 214$$
27. The theory predicts the proportion of beans in the four groups A, B, C and D should be 9 : 3 : 3 : 1. In an experiment among 1,600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory ?

28. From the data relating to the yield of dry bark ( $X_1$ ), height ( $X_2$ ) and girth ( $X_3$ ) for 18 Cinchara plants, the following correlation co-efficients were obtained.

$r_{12} = 0.77$ ,  $r_{23} = 0.52$ ,  $r_{13} = 0.72$ . Find the partial correlation co-efficient  $r_{12.3}$  and multiple correlation co-efficient  $R_{1.23}$ .

29. Prepare ANOVA table for the null hypothesis for the following data :

| A  | B  | C  |
|----|----|----|
| 75 | 74 | 60 |
| 70 | 78 | 64 |
| 66 | 72 | 65 |
| 69 | 68 | 55 |

Twelve plots are divided into 3 groups. Fertilizers A and B are applied to first two groups while third group is a control C with no fertilizers.

30. The following table showing the distribution of digits in numbers chosen from a telephone directory.

| Digits    | : | 0     | 1     | 2   | 3   | 4     | 5   | 6     | 7   | 8   | 9   | Total  |
|-----------|---|-------|-------|-----|-----|-------|-----|-------|-----|-----|-----|--------|
| Frequency | : | 1,026 | 1,107 | 997 | 966 | 1,075 | 933 | 1,107 | 972 | 964 | 853 | 10,000 |

Test whether the digits may be taken to occur equally frequently in the directory.

(6 × 5 = 30 marks)

#### Section D

*Answer any two questions.  
Each question carries 12 marks.*

31. (a) What is meant by Correlation ?

- (b) Calculate Pearson's co-efficient of correlation for the following :—

|                      |   |    |    |    |    |    |    |    |    |    |    |
|----------------------|---|----|----|----|----|----|----|----|----|----|----|
| Adult Cost (in '000) | : | 39 | 65 | 62 | 90 | 82 | 75 | 25 | 98 | 36 | 78 |
| Sales (in lakh Rs.)  | : | 47 | 53 | 58 | 86 | 62 | 68 | 60 | 91 | 51 | 84 |

32. (a) What do you understand by regression ?

- (b) From the following data, obtain two regression equations :

|           |   |    |    |     |     |    |     |    |    |     |    |
|-----------|---|----|----|-----|-----|----|-----|----|----|-----|----|
| Sales     | : | 91 | 97 | 108 | 121 | 67 | 124 | 51 | 73 | 111 | 57 |
| Purchases | : | 71 | 75 | 69  | 97  | 70 | 91  | 39 | 61 | 80  | 47 |

Turn over

33. (a) Give the concept and definition of partial correlation co-efficient.
- (b) A opinion poll was conducted to find the relation to a proposed civic reform in 100 members of each of the two political parties as below :

|         |     | <i>Favourable</i> | <i>Unfavourable</i> | <i>Indifferent</i> |
|---------|-----|-------------------|---------------------|--------------------|
| Party A | ... | 40                | 30                  | 30                 |
| Party B | ... | 42                | 28                  | 30                 |

Test for independence of reactions with the party affiliations given that  $\chi^2_{0.05}(2) = 5.99$ .

(2 × 12 = 24 marks)