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B. TECH. (BIOTECHNOLOGY)
(SEM-IV) THEORY EXAMINATION 2017-18
STATISTICAL TECHNIQUES

Time: 3 Hours *Total Marks: 100*

Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. **Attempt *all* questions in brief.** **2 x 10 = 20**

a. Define Percentage Bar Diagrams.
b. Define the coefficients of Kurtosis.
c. State Baye's theorem.
d. Write the formula of Normal distribution.
e. Define correlation.
f. Define Mathew correlation coefficient.
g. What is statistical estimation?
h. Give the formula of determining sample size for estimating a population mean.
i. Define Markov processes.
j. Define F-Test.

SECTION B

2. **Attempt any *three* of the following:** **10 x 3 = 30**

a. The following are the figures of sales and net profits of public sector units over the Last three years. Represents the data by a suitable diagram.

year	sales	Net profits
2005-2006	14	29
2006-2007	11	61
2007-2008	17	-74

b. If the θ is the acute angle between the two regression lines in the case of two variables x and y, show that $\tan\theta = \frac{1-r^2}{r}.\frac{\sigma_x\sigma_y}{\sigma_x^2+\sigma_y^2}$ where $r, \sigma_x\sigma_y$ have their usual meanings.

c. Two managers are asked to ranks groups of employees in order of potential for eventually becoming top managers. The ranking are as follows:

Employees (s)	1	2	3	4	5	6	7	8	9	10
Ranking by manager (1)	10	2	1	4	3	6	5	8	7	9
Ranking by manager (2)	9	4	2	3	1	5	6	8	7	10

Compute the coefficient of rank correlation and comment on the value.

d. A Sample of 200 persons with a particular disease was selected. Out of these, 100 where Given a drug and the others were not given any drug. The results are as follows:

Numbers of persons			
	Drug	Drug	total
cured	65	55	120
No cured	35	45	80
total	100	100	200

Test, whether the drug is effective or not. $\gamma^2_{0.05} = 3.84$.

e. The Simple correlation coefficients between temperature (X_1),Corn yield(X_2) rainfall (X_3) Are: $r_{12} = 0.59, r_{13} = 0.46, r_{23} = 0.77$ calculate partial correlation coefficient $r_{12.3}$ and multiple correlation coefficient $R_{1.23}$

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) The first four moments of a distribution about x=4 are 1, 4, 19, 45. Comment on the skewness of the distribution.

(b) Represents the following data by a histogram:

Size class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
frequency	5	22	11	16	27	7	8	9	2

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Out of 800 families with 5 children each, how many would you expect to have (a) 3 boys (b) 5 girls Assume equal probabilities for boys and girls.

(b) On the average, one in 400 items is defective. If the items are packed in boxes

of 100, what is the probabilities hat any given box of items will contain.(i) no defective (ii) less than two defectives.

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) The regression equations calculated from given set of observations for two random variable are x = -o.4y+6.4 and y=-0.6x+4.6 calculate mean values of x and y.

(b) Prove that Poisson distribution is the limiting case of Binomial distribution.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) Ten competitors in a beauty contest are ranked by three judges in the following order:

1st judge	1	6	5	10	3	2	4	9	7	8
2nd judge	3	5	8	4	7	10	2	1	6	9
3rd judge	6	4	9	8	1	2	3	10	5	7

Use the rank correlation coefficient to determine which pair of judges has the nearest approach to common tastes in beauty.

(b) On the basis of figures recorded below for supply and price for nine years, calculate the regression coefficients and the value of r.

year	2000	2001	2002	2003	2004	2005	2006	2007	2008
supply	22	45	87	66	98	77	34	65	84
price	35	56	87	59	67	43	87	44	50

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) State and proof Erlang loss formula to the service distribution.

(b) The following data represents the number of units of production per day turned out by 5 different workers using 4 different types of machines.

	Machine type			
	A	B	C	D
Workers				
1	44	36	48	38
2	48	40	50	44
3	37	38	40	36
4	45	34	45	32
5	49	44	50	40

Test (a) whether the mean productivity is the same for 4 different machine types. $\nu_{2,12}, F_{0.05} = 3.49$.