

December 2023

B.Tech (ENV) Re-Appear - III SEMESTER

Statistical Analysis and Environmental Modelling (PCC-ENV-303)

Time: 3 Hours

Max. Marks:75

Instructions:

1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
2. Answer any four questions from Part -B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.
4. Use of calculator is allowed.

PART -A

Q1 (a) Calculate the eigenvectors of the following: (1.5)

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

(b) Differentiate between t - distribution and Chi square distribution. (1.5)

(c) What do you understand by Accuracy and Precision? Explain. (1.5)

(d) Define the following terms: (1.5)

1. Local Maxima
2. F-test
3. Taylor series

(e) From the following table, calculate the rank correlation coefficient. (1.5)

X	48	33	40	9	16
Y	13	23	24	6	15

(f) State the Linearity property of Laplace transform. (1.5)

(g) What do you understand by significant figures? Explain. (1.5)

(h) Write any three limitations of Lotka Voltra Model. (1.5)

(i) A problem in Mathematics is given to three students A, B and C whose (1.5)

chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ respectively. What is the probability that the problem will be solved?

(j) Calculate (1.5)

$$\int x\sqrt{2x+1} dx$$

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- (b) Calculate the Karl Pearson's coefficient of correlation from the following data: (7)

X	24	27	28	28	29	30	32	33	35
Y	18	20	22	25	22	28	30	27	30

Q5 (a) Solve

$$(x+y)^2 \frac{dy}{dx} = a^2$$

- (b) Solve the system of equations with the help of matrices: (7)

$$3x + y + 2z = 3$$

$$2x - 3y - z = -3$$

$$x + 2y + z = 4$$

- Q6 (a) The customer accounts of a certain department store have an average balance of Rs. 120 and a standard deviation of Rs. 40. Assuming that the account balances are normally distributed: (8)

1. What proportion of the account is over Rs. 150?
2. What proportion of account is between Rs. 100 and Rs. 150 ?
3. What proportion of account is between Rs. 60 and Rs. 90 ?

[Given : Value of Z at 0.75 is 0.2735

Value of Z at 0.5 is 0.1915

Value of Z at 1.5 is 0.4332]

- (b) Find the volume of the solid generated by revolving the ellipse (7)

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, a > b \text{ be the major axis.}$$

Q7 Explain the following in detail. (Choose any one) (15)

1. Lotka Voltra Model
2. Leslie's Matrix Model
3. Gaussian Plume Model

PART -B

Q2 (a) Calculate Mean, Median and Mode using following data: (8)

Marks	Number of Students
Above 0	80
Above 10	77
Above 20	72
Above 30	65
Above 40	55
Above 50	43
Above 60	28
Above 70	16
Above 80	10
Above 90	8
Above 100	0

(b) Fit a poisson distribution on the following : (7)

X	0	1	2	3	4
F	192	100	24	3	1

Q3 (a) The average breaking strength of steel rods is specified to be 18.5 thousands kg. For this a sample of 14 rods was tested. The mean and standard deviation obtained were 17.85 and 1.955 respectively. Test the significance of the deviation using t – test. (5)

[Given, the value of t at 5% level of significance is 2.16]

(b) In a sample of 8 observations, the sum of square of deviations from mean is 94.5 . In other sample of 10 observations, the sum of deviations from mean is 101.7 . Test (using F test) whether there is a significant difference of variation. (5)

[Given, the value of F at 5% level of significance is 3.29] (5)

(c) Show that the maximum value of following is less than its minimum value.

$$x + \frac{1}{x}$$

Q4 (a) From the following data obtain the two regression equations using the method of least squares. (8)

X	1	2	3	4	5	6	7
y	3	7	10	12	14	17	20