Printed Page:- 05 **Subject Code:- AMIAS0402**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech (Integrated)

SEM: IV - THEORY EXAMINATION (2023- 2024)

Subject: Engineering Mathematics- IV

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. Analyze the following statements to be true: (CO1) 1

(a) Correlation coefficient is the geometric mean between the regression coefficients.

(b) If one of the regression coefficients is greater than unity, the other must be less than unity.

(c) Arithmetic mean of regression coefficient is greater than the Correlation coefficient.

(d) All of the above

1-b. Two line of regression are x+2y-5 = 0, x+y=3 then mean value of x and y are respectively. (CO1) 1

(a) 4,7

(b) 1,2

(c) -1,-2

(d) None of these

1-c. While testing the significance of difference of two sample means in case of small sample, then the degree of freedom is: (CO2) 1

(a) $n_1 - 1$

(b) $n_1 + n_2 - 2$

(c) $n_2 - 1$

(d) $n_1 n_2 - 2$

1-d. In ANOVA, when calculated value of F is greater than the tabulated value, then 1

the null hypothesis is? (CO2)

(a) Accepted
(b) Rejected
(c) There is a no significant difference between two sample means.
(d) None of these

1-e. A table with all possible value of a random variable and its corresponding probabilities is called _____ . (CO3) 1

(a) Probability mass function
(b) Probability density function
(c) Probability distribution
(d) Cumulative distribution function

1-f. The value of area under a Probability density function? (CO3) 1

(a) 0
(b) 1
(c) ∞
(d) 1/2

1-g. Normal Distribution is applied for _____ . (CO4) 1

(a) Discrete random variable
(b) Irregular random variable
(c) Any random variable
(d) Continuous random variable

1-h. In a Poisson Distribution, if 'n' is the number of trials and 'p' is the probability of success, then the mean value is given by? (CO4) 1

(a) m = np
(b) $m = (np)^2$
(c) m = np(1-p)
(d) m = p

1-i. Function $f(x)=x^3 \cos x$ is: (CO5) 1

(a) Odd function
(b) Even function
(c) Neither even nor odd
(d) None of these

1-j. The unit digit of 7^{73} is (CO5) 1

(a) 1
(b) 9
(c) 7
(d) None of these

2. Attempt all parts:-

2.a. Prove that Correlation coefficient is the geometric mean between the regression coefficients. (CO1) 2

2.b. Write the Control Limits (UCL & LCL) for C chart. (CO2) 2

2.c. Define probability density function. (CO3) 2

2.d. Find the mean of Binomial distribution. (CO4) 2

2.e. Calculate the sum of first 10 perfect cubes? (CO5) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Calculate mode for the following data: (CO1) 6

x	4	5	6	7	8	9	10	11	12	13
f	2	5	8	9	12	14	14	15	11	13

3-b. Find the moment coefficient of Skewness for the following data: (CO1) 6

Class interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70
f	8	12	20	30	15	10	5

3-c. In a blade manufacturing factory, 1000 blades are examined daily. Draw the np Chart for the following table and examine whether the process is under control? (CO2) 6

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of Defective Blades	9	10	12	8	7	15	10	12	10	8	7	13	14	15	16

3-d. The following table gives the number of accidents that took place in an industry during various days of a week. Test if accidents are uniformly distributed over the week (CO2) 6

Day	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents	14	18	12	11	15	14

Given that tabular value of Chi-Square at 5% LOS for 5 degree of freedom is 11.09.

3.e. The joint probability density function of a two dimensional random variable (X, Y) is given by (CO3) 6

$$f(x,y) = \begin{cases} 2 & 0 < x < 1,\ 0 < y < x \\ 0 & \text{elsewhere} \end{cases}$$

i) find the conditional density function of Y given X=x and conditional density function of X given Y=y

ii) check the independence of X and Y.

3.f. A random variable X has an exponential distribution with probability distribution function is given by $f(x) = \begin{cases} 5e^{-5x}, & \text{for } x > 0 \\ 0, & \text{otherwise} \end{cases}$. Find probability that X is not less than 2? (CO4) 6

3.g. Find the unit digit of $(4137)^{754}$. (CO5) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Calculate the coefficient of correlation for the following data: (CO1) 10

x	10	14	18	22	26	30
y	18	12	24	6	30	36

4-b. Find the multiple linear regressions of y on x and z from the data relating to three variables: (CO1) 10

x	7	12	17	20
y	4	7	9	12
z	1	2	5	8

5. Answer any one of the following:-

5-a. The nicotine contents in two random samples of tobacco are given below: 10
Sample 1: 21 24 25 26 27
Sample 2: 22 27 28 30 31 36
Can you say that the two samples came from the same population? Given that the tabular value $F_{0.05}$ =6.26 for d.f. (5,4) and $t_{0.05}$=2.26 for d.f. 9. (CO2)

5-b. Fit a binomial distribution for the following data and also test the goodness of fit. 10
x: 0 1 2 3 4 5 6
f: 5 18 28 12 7 6 4
Given that the tabular value of χ^2 for 2 degree of freedom is 5.99 at 5% LOS. (CO2)

6. Answer any one of the following:-

6-a. A two dimensional random variable (X,Y) have a bivariate distribution is given by: 10

$$P(X=x, Y=y) = \frac{x^2+y}{32},\ x=0,1,2,3 \text{ and } y=0,1$$

Find the marginal distribution of X and Y and conditional distribution of X given Y=1. (CO3)

6-b. A continuous RV X has a probability distribution function $f(x) = kx^2e^{-x},\ x \geq 0$ Find k, mean and variance. (CO3) 10

7. Answer any one of the following:-

7-a. In 800 families with 5 children each, how many families would be expected to have- (CO4) 10

I. 3 boys and 2 girls
II. 2 boys and 3 girls
III. No girl
IV. At most 2 girls. (Assume probabilities for boys and girls to be equal)

7-b. Fit a Poisson distribution to the set of observations:(CO4) 10

x	0	1	2	3	4
f(x)	122	60	15	2	1

8. Answer any <u>one</u> of the following:-

8-a. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5? (CO5) 10

8-b. Calculate the number of zeros at the end of the product $5^5 \times 10^{10} \times 15^{15} \times ..... \times 125^{125}$? (CO5) 10