Printed Page:- 05 **Subject Code:- AAS0402 /AASH0402**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2024- 2025)

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. The mode of the following distribution is.... (K1,CO1) 1

7,4,3,5,6,3,3,2,4,3,4,3,3,4,4,2,3

(a) 7

(b) 6

(c) 5

(d) 3

1-b. Analyze the following statements to be true: (K1,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-c. The standard error of difference of means of two large random samples of sizes n_1 and n_2 drawn from the population of variance σ^2 is:(K1,CO2) 1

(a) $\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}$

(b) $\sigma\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}$

(c)

.

$\sigma\sqrt{\frac{1}{n_1}-\frac{1}{n_2}}$

(d) $\sqrt{n_1+n_2}$

1-d. A subset of population is.....(K1,CO2) 1

(a) Distribution

(b) Sample

(c) Data

(d) None of these

1-e. The sum of probabilities of a discrete random variable is (K1,CO3) 1

(a) Zero

(b) Four

(c) One

(d) Three

1-f. Let X and Y be the jointly continuous random variables with joint CDF satisfies the following condition: (K1,CO3) 1

(a) $F_{XY}(-\infty, \infty)=1$

(b) $F_{XY}(x, -\infty)=1$

(c) $F_{XY}(-\infty, y)=1$

(d) None of these

1-g. Consider a random variable with exponential distribution with $\lambda=1$, then the probability P (X>3) is: (K3,CO4) 1

(a) e^{-3}

(b) e^{-1}

(c) e^{-2}

(d) e^{3}

1-h. Normal Distribution is symmetric about _____ (K1,CO4) 1

(a) Variance

(b) Standard deviation

(c) Covariance

(d) Mean

1-i. Function $f(x)=x^3\sin x$ is: (K2,CO5) 1

(a) Odd

(b) Even

(c) Neither odd nor even

(d) None of these

1-j. If the value of Haar wavelet function in the interval $0 \le t \le 0.5$ is 2 then its value for $0.5 < t \le 1$ is: (K2,CO5) 1

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(a) -1

(b) 1

(c) -2

(d) None of these

2. Attempt all parts:-

2.a. For certain data, 3X+2Y-26=0 and 6X+Y-31=0 are the two regression equations. Find coefficient of correlation. (K3,CO1) 2

2.b. Write the Control Limits (UCL & LCL) for C chart. (K1,CO2) 2

2.c. Define random variable and its type with examples.(K1,CO3) 2

2.d. The probability that a bomb dropped from a plane will strike the target is 1/3. If six bombs are dropped ,then find the probability that exactly two will strike on the target. (K3,CO4) 2

2.e. An urn contains 10 blacks and 10 white balls. Find the probability of drawing two balls of the same colour.(K3,CO3) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Find first four moments about mean for the following individual series: (K3,CO1) 6

x	3	6	8	10	18

3-b. Calculate the rank correlation coefficient between x and y from the following data— 6

(K3,CO1)

x	15	20	27	13	45	60	21	75
y	50	30	55	31	25	10	35	70

3-c. The following are the ranges of lengths of a finished product from 10 samples each of size 5. The central limit for length is 200 cm. Construct the Range R-Chart. Also examine whether the process is under control and state your recommendations. (K3,CO2) 6

Sample Number: 1 2 3 4 5 6 7 8 9 10

Range (R) : 5 0 7 3 3 7 2 8 5 6

Given: $D_3 = 0$, $D_4 = 2.11$.

3-d. In a test given to two groups of students, the marks obtained are as follows: (K3,CO2) 6

First Group 18 20 36 50 49

Second Group 29 28 26

Examine the significance of difference between the mean marks secured by students of the above two groups. (Given as 5% level of significance, the value for 5 d.f. =2.57).

3.e. Find the value of k so that $f(x,y) = kxy$, $1 \le x \le y \le 2$ will be a probability density function. 6

(K3,CO3)

3.f. A filling machine is set to pour 952 ml of oil into bottles. The amounts of fill are normally distributed with a mean of 952 ml. and a standard deviation of 4 ml. Find the probability that a bottle contains oil between 952 ml and 956 ml. 6

P(0<z<1)=0.3413 (K3,CO4)

3.g. Calculate the number of words that can be formed using all the letters of the world ALLAHABAD: (K2,CO5) 6

(i) When the vowel occupy the even position.

(ii) Both L do not occur together.

SECTION-C 50

4. Answer any one of the following:-

4-a. Find the moment coefficient of Skewness and kurtosis of the following data: (K3,CO1) 10

Class interval	0-10	10-20	20-30	30-40	40-50
Frequency	10	20	40	20	10

4-b. Find the multiple linear regressions of y on x and z from the data relating to three variables: (K3,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. A Sample of 400 male students is found to have a mean height of 160 cm. Can it be reasonably regarded as a sample from a large population with mean height 162.5 cm and SD 4.5 cm? Also determine the 95% confidence limits of population mean. Given that the tabular value for two tailed test is 1.96 at 5% LOS. (K3,CO2) 10

5-b. The following table gives the yields on 15 sample plots under three varieties of seeds: 10

Variety I	20	21	23	16	20
Variety II	18	20	17	15	25
Variety III	25	28	22	28	32

Show that the seed varieties show variations more than could be covered by sampling variations. If the tabulated value of F is 3.88 at 5% level for (2,12) degree of freedom.(K3,CO2)

6. Answer any one of the following:-

6-a. A random variable X has the following probability function: (K3,CO3) 10

x	0	1	2	3	4	5	6	7
p(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Then (i) find k

(ii) Evaluate P(X<6),P(X≥6),P(3<X≤6)

(iii) Find the minimum value of x so that P(X≤x) >1/2

6-b. The joint probability mass function of (X, Y) is given by P(x , y) = k(2x+3y), 10

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x=0,1,2; y=1,2,3. Find all the marginal and conditional probability distribution.(K3,CO3)

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

7-a. The number of monthly breakdowns of a computer is a RV having a poisson distribution with mean equal to 1.8 . Find the probability that this computer will function for a month (K3,CO4) 10

1. Without a breakdown
2. With only one breakdown
3. With at least one breakdown
4. With at most three breakdown

7-b. In litters of 4 mice the number of litters which contained 0,1, 2, 3, 4 females were noted. Fit a binomial distribution to the following data: (K3,CO4) 10

No. Of females mice	0	1	2	3	4	Total
No. Of litters	8	32	34	24	5	103

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

8-a. If the number 3422213pq is divisible by 99, find the missing digits p and q. (K3,CO5) 10

8-b. In the following question, a few statements have been given followed by conclusions. Consider the statements to be true and answer which of the given conclusions are correct with respect to the statements and also explain: (K3,CO5) 10

Statement I: All mobiles are laptops.
Statement II: All laptops are computer.
Statement III: Some computers are tablets.
Statement IV: All tablets are palmtop.
Conclusion I: All palmtop are laptops.
Conclusion II: At least some computers are palmtop.
Conclusion III: All laptops are not mobiles.
Conclusion IV: All mobiles being computers is a possibility.