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 (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. Curve which are more sharply peaked than normal curve is called: (CO1) 1

(a) Leptokurtic curve

(b) Mesokurtic curve

(c) Platykurtic curve

(d) None of these

1-b. Karl Pearson's coefficient of skewness of a distribution is 0.32, its S.D. is 6.5 and mean is 29.6. then mode of the distribution is: (CO1) 1

(a) 27

(b) 27.52

(c) 28.20

(d) 27.3

1-c. Z-test is used when: (CO2) 1

(a) When Sample size is small

(b) When Sample size is Large

(c) When Sample size is small or large

(d) When Sample size takes any value

1-d. The distribution used to compare two variances is? (CO2) 1

(a) T – Test

(b) Normal Distribution

(c) Poisson Distribution

(d) F – Test

1-e. If $\Sigma P(x) = k^2 - 8$ then, the value of k is? (CO3) 1

(a) 0

(b) 1

(c) 3

(d) Insufficient data

1-f. The joint pdf of X and Y is given by: 1

$f(x,y) = \begin{cases} ke^{-(x+y)}, & x \geq 0, y \geq 0 \\ 0, & \text{otherwise} \end{cases}$, then find the value of k. (CO3)

(a) 2

(b) 1

(c) 0

(d) 1/2

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

(a) e^{-3}

(b) e^{-1}

(c) e^{-2}

(d) e^{3}

1-h. The shape of the Normal Curve is _____ (CO4) 1

(a) Bell Shaped

(b) Circular Shaped

(c) Spiked Shaped

(d) Spiral Shaped

1-i. Probability of getting a numbered card when a card is drawn from the pack of 52 cards: (CO5) 1

(a) 5/13

(b) 9/13

(c) 4/13

(d) None of these

1-j. If the scaling function Φ(t) is defined in the range [0,2] then Φ(2t) will be defined in: (CO5) 1

(a) [0,1]

(b) [0,0.5]

(c) [0,4]

(d) None of these

2. Attempt all parts:-

2.a. Write down the formula for first four Moments about mean. (CO1) 2

2.b. Write the short note on Confidence limits. (CO2) 2

2.c. Define conditional probability distribution. (CO3) 2

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

2.e. Write the necessary properties of a function to become wavelet? (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. The first four moments of a distribution are 3, 10.5,40.5,168.Comment upon the nature of the distribution. (CO1) 6

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

(CO1)

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

3-c. A die is thrown 276 times and the results of these throws are given below: 6

(CO2)

No. appeared on die	1	2	3	4	5	6
Frequency	40	32	29	59	57	59

Test whether the die is biased or not. Given that tabular value of Chi-Square at 5% LOS for 5 degree of freedom is 11.09.

3-d. Two independent sample of Sizes 7 and 6 had the following values: 6

Sample A: 28 30 32 33 31 29 34

Sample B: 29 30 30 24 27 28 -

Examine whether the samples have been drawn from normal populations having the same variance. Given the tabulated value for d.f. (5, 6) at 5% LOS is 4.39. (CO2)

3.e. The joint probability distribution of two random variables X and Y is given by: 6

$P(X=0,Y=1)=1/3, P(X=1,Y=-1)=1/3,\ P(X=1,Y=1)=1/3.$

Find i) marginal distribution of X and Y

ii) the conditional probability distribution of X given Y=1. (CO3)

3.f. Find the mean and variance of the theoretical binomial distribution. (CO4) 6

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

(i) When the vowel occupy the even position.

(ii) Both L do not occur together.

SECTION C **50**

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

4-a. An incomplete distribution of families according to their expenditure per week is given below. The median and mode for the distribution is ₹ 25 and ₹ 24 respectively. Calculate the missing frequencies. (CO1) 10

Expenditure	0-10	10-20	20-30	30-40	40-50
No. of families	14	?	27	?	15

4-b. Determine the normal equation if the curve $y=\frac{C_0}{x}+C_1\sqrt{x}$ is fitted to the data (x_i, y_i), $i=1,2..n$ by method of least square. Hence fit this curve to the data – (CO1) 10

x	0.1	0.2	0.4	0.5	1	2
y	21	11	7	6	5	6

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

5-a. The following figures relate to the production in kg of three varieties I, II, III of wheat shown in 12 plots: 10

Variety I	14	16	18		
Variety II	14	13	15	22	
Variety III	18	16	19	19	20

Determine if there is a significant difference in production of three varieties? Given tabulated values for degree of freedom (2, 9) at 5% LOS is 4.26. (CO2)

5-b. In a manufacturing process, the number of defectives found in the inspection of 20 lots of 100 samples is given below: 10

Lot No. : 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Defective: 5 4 3 5 4 6 9 15 11 6 7 6 3 5 4 2 8 7 6 4

Determine the control limits of P-chart and state whether the process is in control. (CO2)

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

6-a. If the joint distribution function of X and Y is given by: 10

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

a) Find the marginal densities of X and Y ,

b)Are X and Y independent? (CO3)

6-b. A random variable X has the following probability function: (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

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

7-a. State the Poisson Probability distribution. Prove that Poisson distribution is limiting case of Binomial distribution. (CO4) 10

7-b. 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)

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

8-a. Let $A = R - \{3\}$ and $B = R - \{2\}$. Consider the function f: $A \to B$ defined by $f(x) = \frac{x-2}{x-3}$. 10

Determine if the function f is one − one and onto. (CO5)

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