Printed Page:-05 **Subject Code:- BAS0402 /BASH0402**

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 following statements to be true: (CO1, K1) 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. The mean of 200 items was 50. Later on, it was discovered that two items were misread as 92 and 8 instead of 192 and 88. The correct mean will be.....(CO1, K3) 1

(a) 50.2

(b) 50.7

(c) 50.4

(d) 50.9

1-c. A claim about population that is contradictory to null hypothesis is called...(CO2, K1) 1

(a) Null Hypothesis

(b) Alternate hypothesis

(c) Statistical hypothesis

(d) None of these

1-d. While testing the significance difference of two sample means (size n_1 and n_2) in 1

case of small sample, degree of freedom is...CO2, K1)

(a) $n_1 - 1$

(b) $n_1 - n_2 - 2$

(c) $(n_1 - 1) + (n_2 - 1)$

(d) $n_2 - 1$

1-e. A table with all possible value of a random variable and its corresponding probabilities is called _____ . (CO3, K1) 1

(a) Probability mass function

(b) Probability density function

(c) Probability distribution

(d) Cumulative distribution function

1-f. If $\Sigma P(x) = k^2 - 8$, then,the value of k is...(CO3, K2) 1

(a) 0

(b) 1

(c) 3

(d) Insufficient data

1-g. The area under a standard normal curve is... (CO4, K1) 1

(a) 0

(b) 1

(c) Infinity

(d) Not defined.

1-h. The mean of exponential distribution $f(x) = \lambda e^{-\lambda x}$, $x > 0$ is given by:(CO4, K1) 1

(a) $1/\lambda$

(b) λ

(c) $1/\lambda^2$

(d) λ^2

1-i. An airplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in 1 hours, it must travel at a speed of:(CO5, K3) 1

(a) 300 kmph

(b) 1200 kmph

(c) 600 kmph

(d) None of these

1-j. The missing value in series:12, 13, 25, 38,? ,101, 164 is... (CO5, K3) 1

(a) 36

(b) 40

(c) 63

.

(d) None of these

2. Attempt all parts:-

2.a. Write the normal equation of curve: $y = a + bx^2$ (CO1, K2) 2

2.b. Write the test statistic for testing $H_0: \mu = \mu_0$ for small sample size n? (CO2,K2) 2

2.c. If a coin is tossed twice then write the random variable for number of heads. (CO3, K2) 2

2.d. Find the mean of the binomial distribution $B\left(4, \frac{1}{3}\right)$ (CO4, K2) 2

2.e. The speed of a boat in still water is 15 km / hr. and the rate of current is 3 km / hr. Find the distance travelled downstream in 12 minutes? (CO5, K3) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Calculate first four moments about mean of the given series:1, 3, 7, 9, 10. (CO1, K3) 6

3-b. Obtain the coefficient of correlation for the following data: (CO1, K3) 6

X	10	14	18	22	26	30
Y	18	12	24	6	30	36

3-c. In a test given to two groups of students, the marks obtained are as follows: (CO2,K3) 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-d. To test the effectiveness of inoculation against cholera, the following table was obtained: 6

	Attacked	Not attacked	total
Inoculated	30	160	190
Not inoculated	140	460	600
Total	170	620	790

Use Chi-Square test to defend or refute the statement that the inoculation prevents attack from cholera. If the tabulated value is 3.841 at 5% level. (CO2, K3)

3.e. A two-dimensional random variable (X, Y) has a bivariate distribution given by: 6

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

Find the marginal distribution of X and Y. (CO3, K3)

3.f. Net profit of 400 companies is normally distributed with a mean profit of Rs. 150 lakhs and a standard deviation of Rs. 20 lakhs. Find the number of companies whose profits (Rs. Lakhs) are between 100 and 138. (Area for Z = 2.5 ,1.04 and 0.6 are 0.4938, 0.35 and 0.2251respectively). (CO4, K3) 6

3.g. Five girls are sitting on a bench to be photographed. Seema is to the left of Rani 6

and to the right of Bindu. Mary is to the right of Rani. Reeta is between Rani and Mary. Who is in the middle of the photograph and who are setting at corners of photograph. (CO5, K3)

SECTION-C 50

4. Answer any one of the following:-

4-a. Two lines of regression are given by $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$ and $Var(x) = 12$. Calculate – The mean of x and y (ii) variance of y (iii) the correlation coefficient.(CO1,K3) 10

4-b. Calculate the rank correlation coefficient between X and Y from the following data-(CO1, K3) 10

X	15	20	27	13	45	60	20	75
Y	50	30	55	30	25	10	30	70

5. Answer any one of the following:-

5-a. In a manufacturing process, the number of defectives found in the inspection of 15 lots of 200 samples in each lot is given below: 10
Here in below table D stands for number of defectives.

Lots:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D :	10	5	10	12	11	9	22	4	12	24	21	15	8	14	4

Determine the control limits of P-chart and state whether the process is in control by making P- chart. (CO2, K3)

5-b. The following figures relate to the production in kg of three varieties I, II, III of wheat shown in 12 plots: (CO2, K3) 10

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

Is there any significant difference in the production of three varieties? Given the tabulated value of F for degree of freedom. (2,9) is 4.26 at 5% level of significance.

6. Answer any one of the following:-

6-a. A random variable X and Y is distributed such that its joint probability density f unction given by: 10

$$f(x,y) = \left\{\left(\frac{8xy}{3}\right)\right\}, 1 \le x \le y \le 2$$

$$= 0 \qquad \text{elsewhere}$$

Find the marginal density function of X and Y.(CO3, K3)

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

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

(i) Find the value of k

(ii) Evaluate: $P(X < 6)$

(iii) Evaluate: $P(3 < X \leq 6)$

(iv) Find the minimum value of x so that $P(X \leq x) > 1/2$

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

7-a. If Seven coins are tossed and number of heads noted. The experiment is repeated 128 times and the following distribution is obtained: (CO4, K3) 10

No. of heads	0	1	2	3	4	5	6	7	Total
frequencies	7	6	19	35	30	23	7	1	128

Fit a binomial distribution to the above data.

7-b. Find a moment generating function of a Poisson distribution .Also find its first and second moments about origin. (CO4, K3) 10

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

8-a. Two person A and B were doing exercise. They start running on a circular track simultaneously and in the same direction. If person A takes 4 minute to complete one round, and person B takes 7 minute to complete one round. Find 10

i. After how much time will they meet for the first time

ii. After how much time will they meet for the first time at the starting point

iii. After how much time would they meet for the first time at a point diametrically opposite to the starting point on the track?(CO5, K3)

8-b. (i) A and B together can do a piece of work in 30 days. A having worked for 16 days, B finishes the remaining work alone in 44 days. In how many days shall B finish the whole work alone? 10

(ii) A man and a boy received Rs 800 as wages for 5 days for the work they did together. The man's efficiency in the work was three times that of the boy. What are the daily wages of the boy? (CO5 , K3)