Printed Page:- 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 - CARRY OVER THEORY EXAMINATION - SEPTEMBER 2022

Subject: Engineering Mathematics- IV

Time: 3 Hours Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 mark each & Question No- 2 carries 2 mark each.
3. Section B - Question No-3 is based on external choice carrying 6 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.
5. 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. Find the mean of the following data: (CO1) 1

15, 20, 30,22,25,18,40,50,55 and 65

(a) 24

(b) 34

(c) 26

(d) 65

1-b. Which one is 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-c. The test statistic of the mean of a small random sample of size n with standard deviation s from population with mean μ is given by : (CO2) 1

(a) $\frac{\bar{x}-\mu}{s/\sqrt{n}}$

(b) $\frac{\bar{x}-\mu}{s/n}$

(c) $\frac{\bar{x}-\mu}{s/\sqrt{n-1}}$

(d) $\frac{\bar{x}-\mu}{s/(n-1)}$

1-d. In ANOVA, when calculated value of F is greater than the tabulated value, then the null hypothesis is? (CO2) 1

(a) Accepted

(b) Rejected

(c) There is a no significant difference between two sample means.

(d) None of these

1-e. The value of k for which the function $f(x)=\begin{cases} k\,e^{-3x}, & x>0 \\ 0, & \text{otherwise} \end{cases}$ is probability density function, is (CO3) 1

(a) 1

(b) 2

(c) 3

(d) 1/3

1-f. If x is a discrete random variable, the function f(x) is (CO3) 1

(a) Distribution function

(b) Probability function

(c) Density function

(d) None of these

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

(a) 0

(b) 1

(c) ∞

(d) Not defined.

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 $f(x)=x^3\sin x$ is: (CO5) 1

(a) Even

(b) Odd

(c) Neither odd nor even

(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. What is correlation. Explain Various type of correlation. (CO1) 2

2.b. A random sample of 200 items from a large population gave a mean 50 and S.D. of 9. Determine the 95% confidence interval for the mean of population. (CO2) 2

2.c. A die is tossed thrice. A success is getting 1 or 6 on a toss. Find the mean and the variance of the number of successes. (CO3) 2

2.d. Suppose that a random variable has normal distribution with mean 9 and variance 9. Then find the value of c such that $P(x > c) = 0.16$.(Given that $\phi(1) = 0.34$) (CO4) 2

2.e. What are 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. Fit a second degree parabola to the following data- (CO1) 6

x	0.	1.	2.	3.	4.
y	1.	0.	3.	10.	21.

3-c. 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)

3-d. 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.e. The joint probability density function of the two dimensional random variable (X,Y) is 6

$$f(x,y)=\begin{cases} e^{-k(x+y)} & 0\le y<x<\infty \\ 0 & \text{elsewhere} \end{cases}$$

i) determine the value of k.

ii) the marginal probability density function

iii) the conditional density function of X and Y. (CO3)

3.f. Fit a Poisson distribution to the following data and theoretical frequencies. (CO4) 6

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

3.g. Three news papers A,B and C are published in a certain city. It is estimated from a survey that of the adult population: 20% read A, 16% read B, 14% read C,8% read both A and B, 6

5% read both A and C, 4% read both B and C, 2% read all three. Find the probability what percentage read at-least one of the papers? (CO5)

SECTION C 50

4. Answer any one 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. Find the moment coefficient of Skewness and kurtosis for the following data: (CO1) 10

x	0-10	10-20	20-30	30-40	40-50
f	10	20	40	20	10

5. Answer any one of the following:-

5-a. Sample of sizes 10 and 14 were taken from two normal populations with SD 3.5 and 5.2. The sample means were found to be 20.3 and 18.6. Test whether the means of the two populations are the same at 5% LOS. The tabulated value is 2.07 at 5% LOS for 22 d.f. (CO2) 10

5-b. The following table gives the yields of four varieties of wheat grown in three plots: 10

Varieties

Plots	A	B	C	D
1	200	230	250	300
2	190	270	300	270
3	240	150	145	180

Is there any significant difference in the production of these varieties? If the tabulated value for (8,3) d.f = 4.07 at 5% LOS. (CO2)

6. Answer any one of the following:-

6-a. 10

Let X be a random variable. then $F(x) = \begin{cases} k(1-e^{-x})^2, & x > 0 \\ 0, & \text{elsewhere} \end{cases}$

find i) $f(x)$

ii) the value of k.

iii) $P(1 < x < 2)$

iv) $P(x > 3)$ (CO3)

6-b. The joint pdf of the two dimensional random variable (X,Y) is given by: 10

$$f(x,y) = \begin{cases} 8xy, & 0 < x < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find the marginal and conditional distributions. (CO3)

7. Answer any one of the following:-

7-a. Given a normal distribution with $\mu = 150$ and $\sigma = 10$, find the following probabilities. 10

(CO4)

I. P(150<x<165)

II. P(150<x)

7-b. In a distribution exactly Normal, 31% of the items are under 45 and 8% are over 64. What are the mean and Standard deviation of this Distribution? It is given that if (CO4) 10

$$f(t) = \frac{1}{\sqrt{2\pi}} \int_0^t e^{\frac{-x^2}{2}} dx, f(0.5) = 0.19, f(1.4) = 0.42.$$

8. Answer any one of the following:-

8-a. **A jar contains 12 marbles, 4 red 5 blue and 3 orange. If you pull 3 marbles without replacement** 10

(i) What is the probability of getting all 3 colors in order of blue, orange red?

(ii) What is the probability of getting all orange? (CO5)

8-b. A candidate is called for an interview by three companies . For the first company there are 12 candidates and for the second there are 15 candidates and for the third there are 10 candidates. What are the chances of his getting at least one of the companies. (CO5) 10