Printed Page:- Subject Code:- AAS0303

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: III - CARRY OVER THEORY EXAMINATION - JUNE (2021 - 2022)

Subject: Statistics and Probability

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 marker & 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 mode of the following distribution:(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. Karl Pearson coefficient of skewness of a distribution is 0.32, its standard deviation is 6.5 and mean is 29.6. find the mode of the distribution. (CO1) 1

(a) 17.52

(b) 22

(c) 27.52

(d) 13.52

1-c. A random variable X has the following probability function:(CO2) 1

X:	0	1	2	3	4	5	6	7
p(x):	0	a	2a	2a	3a	a^2	$2a^2$	$7a^2+a$

Then value of a is

(a) $\frac{1}{9}$

(b) -1

(c) $\frac{1}{10}$

(d) $-\frac{1}{10}$

1-d. If f(x) is a Probability density function of a continuous random variable, then $\int_{-\infty}^{\infty} f(x)\,dx$ is equal to(CO2) 1

(a) 0

(b) 1

(c) Undefine

(d) Insufficient data

1-e. In a Binomial Distribution, if 'n' is the number of trials and 'p' is the probability of success, then the mean value is given by-(CO3) 1

(a) np
(b) n
(c) p
(d) np(1-p)

1-f. For a Poisson Distribution, if mean(m) = 1, then P(1) is (CO3) 1

(a) 1/e
(b) e
(c) e/2
(d) Indeterminate

1-g. 95% confidential limits of population mean are :(CO4) 1

(a) $\bar{x} \pm 3\,S.E.$
(b) $\bar{x} \pm 2.58\,S.E.$
(c) $\bar{x} \pm 1.96\,S.E.$
(d) None of these

1-h. The standard error for testing of hypothesis of single mean for large sample is given by:(CO4) 1

(a) $\frac{\sigma}{n}$
(b) $\frac{\sigma}{\sqrt{n}}$
(c) $\frac{\sqrt{\sigma}}{n}$
(d) $\sqrt{\sigma n}$

1-i. A tap can completely fill a water tank in 8 hours. The water tank has a hole in it through which the water leaks out. The leakage will cause the full water tank to get empty in 12 hours. How much time will it take for the tap to fill the tank completely with the hole?(CO5) 1

(a) 12 hrs
(b) 10 hrs
(c) 24 hrs
(d) None of these

1-j. Time taken by A to finish a piece of work is twice the time taken B and thrice the time taken by C. If all three of them work together, it takes them 2 days to complete the entire work. How much work was done by B alone?(CO5) 1

(a) 12 days
(b) 4 days
(c) 6 days
(d) None of these

2. Attempt all parts:-

2.a. Write down normal equations for curve y=a+bx.(CO1) 2

2.b. If the probability density function $f(x) = \begin{cases} kx^3, If & 0 \le x \le 3 \\ 0 & , elsewhere \end{cases}$, Find the value of k.(CO2) 2

2.c. Suppose that a random variable x has normal distribution with mean 9 and variance 9. Then find the value of c such that P(x>c)=0.16 .(Given that $\Phi(1)=0.34$) (CO3) 2

2.d. Explain the term ' Critical Value' in testing of hypothesis.(CO4) 2

2.e. A and B together can complete a piece of work in 15 days and B alone in 20 days. In how many days can A alone complete the work? (CO5) 2

SECTION B 30

3. Answer any five of the following:-

3-a. Calculate Median from the following observation:(CO1) 6

Marks	:	0-10	10-30	30-60	60-80	80-90
No. of Students	:	5	15	30	8	2

3-b. Calculate the Karl Pearson's coefficient of correlation from the following Observations:(CO1) 6

Husband's age	:	35	34	40	43	56	20	38
Wife's age	:	32	30	31	32	53	20	33

3-c. The distribution function of a random variable X is given by- (CO2) 6

$$F(x)=\begin{cases} 0, & x<0 \\ cx^3, & 0\le x<3 \\ 1, & x\ge 3 \end{cases}$$

Find :

I. The constant c
II. The density function f(x)
III. P(X>1)
IV. P(1<X<2)

3-d. Find the moment generating function of the distribution $\mathbf{f(x)=\frac{1}{c}e^{\frac{-x}{c}};0\le x\le\infty,\ c>0.}$ (CO2) 6

3.e. If there are 3 misprints in a book of 1000 pages find the probability that a given page will contain-(CO3) 6

i. No misprint
ii. More than 2 misprints

3.f. Find the maximum likelihood estimate for the parameter λ of a distribution $f(x,\lambda)=\frac{e^{-\lambda}\lambda^x}{x!};\ x=0,1,2,\ldots..$ of a sample size n.(CO4) 6

3.g. Two trains start at the same time form A and B and proceed toward each other at the speed of 75 km/hr and 50 km/hr respectively. When both meet at a point in between, one train was found to have travelled 175 km more than the other. Find the distance between A and B?(CO5) 6

SECTION C 50

4. Answer any one of the following:-

4-a. Use the method of least squares to fit the curve $y=\frac{a}{x}+b\sqrt{x}$ to the following data::(CO1) 10

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

4-b. After 9/11 attack on world trade center, a company could partially recover the following record on the analysis of correlation: 10

$5x-6y+90=0$

$15x-8y-130=0$

$\sigma_x^2 = 9$.

On the basis of the above information, Find: (i) Mean values of *x* and *y* (ii) Coefficient of correlation (iii) Variance of *y*.(CO1)

5. Answer any one of the following:-

5-a. State Baye's Theorem. In bolt factory, Machines A,B and C manufacture respectively 25%,35% and 40% of the total. Of their output 5,4 and 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine B.(CO2) 10

5-b. Two dimensional random variable (X,Y) have the joint density function 10

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

.Find the marginal and conditional distributions functions.(CO2)

6. Answer any one of the following:-

6-a. Fit a poisson distribution to the following data and calculate the theoretical frequencies : (CO3) 10

Deaths	0	1	2	3	4
Frequencies	121	61	14	3	1

6-b. The daily wages of 1000 workers are distributed around a mean of Rs. 140 and with standard deviation of Rs. 10. Estimate the number of workers whose daily wages will be- (CO3) 10

I. Between Rs. 140 and Rs. 144
II. Less than Rs. 126
III. More than Rs. 160.

$$\left(\text{Given that } \emptyset(z) = \frac{1}{\sqrt{2\pi}} \int_0^z e^{\frac{-z^2}{2}} dz, \emptyset(0.4) = 0.155, \emptyset(1.4) = 0.419, \emptyset(2) = 0.0228\right)$$

7. Answer any one of the following:-

7-a. To test the effectiveness of vaccination against CORONA, the following data were obtained : 10

	Attacked	Not attacked	Total
Vaccinated	30	160	190
Not Vaccinated	140	460	600
Total	170	620	790

(The figures represent the number of persons)

Use χ^2-test to test whether the Vaccination prevents attack from CORONA.(CO4)

(Tabulated value of χ^2 at 5% level of Significance for 1 d.f. = 3.84)

7-b. A test was given to 5 students chosen at random from the B.tech. class of each of three different colleges. Their scores were found as follows : 10

Colleges	Scores				
A	90	70	60	50	80
B	70	40	50	40	50
C	60	50	60	70	60

Use the ANOVA and determine whether the Scores of students of three Colleges is significantly differ each other. Given tabulated value F(2,12)=3.89 at 5% level of significance.(CO4)

8. Answer any one of the following:-

8-a. Six friends are sitting in a circle and are facing the center of the circle. Deepa is between Prakash and Pankaj. Priti is between Mukesh and Lalit. Prakash and Mukesh are opposite to 10

each other.
(i)Who is sitting right to Prakash ? (ii) Who is just right to Pankaj ? (iii) Who are the neighbors of Mukesh ? (iv) Who is sitting opposite to Priti ? (CO5)

8-b. (i) A boat, while going downstream in a river covered a distance of 50 miles at an average speed of 60 miles per hour. While returning, because of the water resistance, it took 1 hour 15 minutes to cover the same distance. What was the average speed during the whole journey?(CO5) 10

(ii) A man can row 40 km upstream and 55 km downstream in 13 hours. Also, he can row 30 km upstream and 44 km downstream in 10 hours. Find the speed of the man in still water and the speed of the current?(CO5)