NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B. Tech. 2nd Year 3rd Semester
Theory Examination (2021-2022)

Statistics and Probability

Time: 3:00 Hours   **MM: 100**

General Instructions:

➢ All questions are compulsory. It comprises of three Sections, A, B, and C.
➢ **Section A**: Question No- 1 is objective type questions carrying 1 mark each, Question No- 2 is very short answer type carrying 2 mark each.
➢ **Section B -** Question No-3 is Long answer type -I question with external choice carrying 6 marks each.
➢ **Section C** - Question No. 4-8 are Long answer type –II (within unit choice) questions carrying 10 marks **each**.
➢ No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

Section A

1. **Attempt all question and each question carry one mark:**

(a) The most stable measure of central tendency is   (CO 1)

   (i)   The mean

   (ii)   The median

   (iii) The mode

   (iv)   None of these.

(b) The statement that the variance is equal to the second central moment   (CO 1)

   (i)   Always true

   (ii)   Sometimes true

   (iii)   Never true

   (iv)   Ambiguous

(c) A random variable X has the following probability density function: (CO 2)

$$f(x) = \begin{cases} x, \ 0 < x < 1 \\ 0, \ elsewhere \end{cases}$$

   (i) True

   (ii) False

(d) Probability of impossible event is   (CO 2)

(i) 0

(ii) $\frac{1}{2}$

(iii) 1

(iv) None of these

(e) Which one is continuous probability distribution (CO 3)

    (i)   Geometric

    (ii)   Poisson

    (iii)   Normal

    (iv)   Binomial

(f) Mean and Variance of Binomial Distribution is (CO 3)

    (i) np, nq

    (ii) $np, \sqrt{npq}$

    (iii) $\sqrt{np}, \sqrt{npq}$

    (iv) np, npq

(g) Which test is used for equality of variance (CO 4)

    (i)   Z- Test

    (ii)   t- Test

    (iii)   F- Test

    (iv)   All of the above

(h) Confidence limits for z test at 5% level of significance if $z_\alpha = 1.96$ is (CO 4)

    (i) $\bar{x} - 1.96\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + 1.96\frac{\sigma}{\sqrt{n}}.$

    (ii) $\bar{x} - 2.58\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + 2.58\frac{\sigma}{\sqrt{n}}.$

    (iii) $\bar{x} - 1.96\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + 2.58\frac{\sigma}{\sqrt{n}}.$

    (iv)   None of the above.

(i) A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day? (CO 5)

    (i)   12 days

    (ii)   15 days

    (iii)   16 days

    (iv)   18 days

(j) What will be the angle between the two hands at 05: 40? (CO 5)

(i) 50^0

(ii) 60^0

(iii) 70^0

(iv) 86^0

2. Attempt all question and each question carry two marks:

(a) Write the formula of measures of skewness.   (CO 1)

(b) Define is the trial and events with examples.   (CO 2)

(c) If $X \sim N(0,1)$, prove that $E(X^2) = 1$.   (CO 3)

(d) Write a short note on statistical inferences.   (CO 4)

(e) How many times are the hands of a clocks coincide in a day?   (CO 5)

Section B

3. Attempt any five of the following each question carry 6 marks.

(a) Obtain normal equation by method of least square to the curve $y = c_0 x + \dfrac{c_1}{\sqrt{x}}$. Fit it to the

following data: (CO 1)

$x:$	0.2	0.3	0.5	1.0	2.0
$y:$	14	14	11	6	3

(b) The first four moments of a distribution about a value 4 are $-1.5, 17, -30$ and 108. Find the moment about mean and measures of kurtosis also comment upon the nature of the distribution.   (CO 1)

(c) The joint probability distribution of two random variables X and Y is given by: $P(X = 0, Y = 1) = \frac{1}{3}, P(X = 1, Y = -1) = \frac{1}{3}$ and $P(X = 1, Y = 1) = \frac{1}{3}$ find the marginal distribution of X and Y and also find conditional probability of X when Y=1.   (CO 2)

(d) State and proof Baye's Theorem.   (CO 3)

(e) Find the moment generating function of the exponential distribution   (CO 3)
$$f(x) = me^{-xm}; 0 \leq x \leq \infty$$

(f) Find the maximum likely hood estimator for λ for Poisson distribution and also find variance.   (CO 4)

(g) 6 Boys are sitting in a circle and facing towards the Centre of the circle. Rajeev is sitting to the right of Mohan but he is not just at the left of Vijay. Suresh is between Babu and Vijay. Ajay is sitting to the left of Vijay. Who is sitting to the left of Mohan?   (CO 5)

Section C

Answer any one of the following and each question carry 10 marks.

4a Fit trend by taking 1990 as origin year to the following data   (CO 1)

years	1990	1991	1992	1993	1994	1995	1996	1997
Sales(000's)	1.0	1.2	1.8	2.5	3.6	4.7	6.6	9.1

4b Compute the rank correlation coefficient for the following data: (CO 1)

Person:	A	B	C	D	E	F	G	H	I	J
X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

Answer any one of the following and each question carry 10 marks.

5a In a bolt factory, machines A, B and C produced 35%,25% and 40% of the total. Of their output 4,5 and 2 percent bolts are defective. A bolt is drawn at random from the product and it is found to be defective. What is the probability that is was manufactured by machine A, B and C? (CO 2)

5b A random variable X has the following probability function: (CO 2)

x	0	1	2	3	4	5	6	7
P(x)	0	a	2a	2a	3a	a^2	$2a^2$	$7a^2+a$

  (i) Find a

  (ii) Evaluate $P9X < 6), P(X \geq 5)$ and $P(1 < X \leq 6)$

Answer any one of the following and each question carry 10 marks.

6a Out of 800 families with 4 children each, how many families would be expected to have

  (i) 2 boys and 2 girls

  (ii) At least one boy

  (iii) No girl

  (iv) At most two girls

  Assuming equal probabilities for boy and girls (CO 3)

6b The income of a group of 10.000 persons was found to be normally distributed with the mean 750 rupees p.m. and standard deviation of 50 rupees. Show that, of this group about 95% had income exceeding 668 rupees and 5% had income exceeding 832 rupees. Also find the lowest among the richest 100. (CO 3)

Answer any one of the following and each question carry 10 marks.

7a From the following data, use chi square- Test and conclude whether inoculation is effective in preventing Tuberculosis: where χ^2 at 5% level of significance is 3.841.   (CO 4)

	Attacked	Non-Attacked	Total
Inoculated	31	469	500
Not inoculated	185	1315	1500
Total	216	1784	2000

7b The two random samples reveal the following data:

Sample no	Size	Mean	Variance
I	16	440	40
II	25	460	42

Test whether the sample come from same normal population.   (CO 4)

Answer any one of the following and each question carry 10 marks.

8a A can do a piece of work in 12 days and B in 20 days. If they together work on it for 5 days and remaining work is completed by C in 3 days, then in how many days can C do the same work alone?

(CO 5)

8b. A tap can fill a tank in 10 minutes and another can empty it in 6 minutes. If the tank is already two-fifths full and both the taps are opened together, will the tank be filled or emptied? How long will it take before the tank is either filled completely or emptied completely, as the case may be?   (CO 5)