Printed page: 03. **Subject Code:ACSBS0105**

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY ,GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.TECH

(SEM: First Theory Examination -2020-2021)

Subject: Introductory Topics In Statistics, Probability And Calculus

Time: 3Hours **Max. Marks:100**

General Instructions:

- All questions are compulsory. Answers should be brief and to the point.
- This Question paper consists of ...03.....pages & ...8.....questions.
- It comprises of three Sections, A, B, and C. You are to attempt all the sections.
- 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. You are expected to answer them as directed.
- Section B - Question No-3 is Long answer type -I question with external choice carrying 6 marks each. You need to attempt any five out of seven questions given.
- Section C -Question No. 4-8 are Long answer type –II (within unit choice) questions carrying 10marks each. You need to attempt any one part *a* or *b*.
- Students are instructed to cross the blank sheets before handing over the answer sheet to the invigilator.
- No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.
- Use of calculator is allowed.

SECTION – A

1.	**Answer the following:**	**[10×1=10]**	**CO**
a.	The statistical material which the investigator originates for the purpose of inquiry in hand refers to which type of data?	**(1)**	**CO1**
b.	The government and nongovernment publications are considered which type of data source external or internal?	**(1)**	**CO1**
c.	The interquartile range is the measure of _____.	**(1)**	**CO2**
d.	If a constant (non-zero) value is added to each value of a set of observations, the variance of the resultant variable will _____ .	**(1)**	**CO2**
e.	If A, B and C are three events associated with an experiment and P(B) = 3/2P(A) and P(C) = P(B) then, P(A) = _____.	**(1)**	**CO3**
f.	If you toss n coins how many possible outcomes you will get?	**(1)**	**CO3**
g.	If the mean is 3 and variance is 4 of a random variable X. Check whether X follows binomial distribution.	**(1)**	**CO4**
h.	If X is a Normal variate with mean $\mu = 2$ and variance $\sigma^2 = 4$, then the $P(X > 2)$ is _____.	**(1)**	**CO4**
i.	Given x = 4 cost and y = 4 sint. Find dy/dx.	**(1)**	**CO5**
j.	To change cartesian coordinates (x,y) to polar coordinate (r, θ,); dxdy is replaced by _____ .	**(1)**	**CO5**

2. Answer the following: **[5×2=10]** **CO**

a. Write any two chief sources of secondary data. **(2)** **CO1**

b. A class of five students write a test and the results are as follows 58,25,67,90 and 76 marks. Find the quartiles and interquartile range. **(2)** **CO2**

c. The probability mass function of a random variable X is zero except at point 0 and 1. At these points it has probabilities $P(X = 0) = k^2$, $P(X = 1) = 3\ k^2$ for $k > 0$. Find k and mean. **(2)** **CO3**

d. If the probability that an applicant for driver's licence will pass the road test on any given trial is 0.7, what is the probability that he will finally pass the test on third trial? **(2)** **CO4**

e. Evaluate the integral $\int_0^1 \int_0^x e^{\frac{y}{x}}\, dy\, dx$. **(2)** **CO5**

SECTION – B

CO

3. Answer any five of the following- **[5×6=30]**

a. When is a physical sample measured instead of a physical population? Explain with the help of example. **(6)** **CO1**

b. Write short notes on (i) Frequency polygon (ii) Ogive Curve (iii) Histogram. **(6)** **CO2**

c. A bag contains 5 white and 4 black balls. Two balls are drawn at random one after the other without replacement. Find the probability that both balls drawn are black. **(6)** **CO3**

d. The average and standard deviation of shares of three companies A,B and C are 45, 55, 60 and 15, 11, 15 respectively. Find the coefficient of variations for A, B, and C company. Which share in your opinion appears to be more stable? If you are holder of all three shares which one would you like to dispose off at present? **(6)** **CO2**

e. Let X be a random variable defined by probability density function $f(x) = 3x^2$ when $0 < x < 1$ and zero otherwise. Find (a) E(X), (b) E(3X-2). **(6)** **CO4**

f. Using the transformation $x + y = u, y = uv$; show that **(6)** **CO5**

$$\int_0^1 \int_0^{1-x} e^{\frac{y}{(x+y)}} dy dx = \frac{1}{2}(e-1)$$

g. Change the order of integration in $I = \int_0^1 \int_{x^2}^{2-x} xy\, dy dx$ and hence evaluate the same. **CO5**

SECTION – C

CO

4 Answer any one of the following- **[5×10=50]**

a. Explain clearly what you understand by science of statistics. Discuss its scopes and limitations. **(10)** **CO1**

b. What are Simple random sampling, Stratified sampling and Quota sampling? Also write atleast one merit and one limitation of these sampling methods. **(10)** **CO1**

5. Answer any one of the following-

a. (i) In a trip organised by a college there were 80 persons each of whom paid Rs. 405 on an average. There were 60 students, each of whom paid Rs. 400. Members of teaching staff were charged at a higher rate. The number of servants (all males) was six, and they were not charged anything. The number of ladies was 20 per cent of the total, and there was only one lady staff member. Tabulate this information. **(10)** **CO2**

(ii) The price of a selected stock over a five day period is shown as 170, 110, 170, 156 and 160. Compute the mean, median and mode.

b. Ten students gave exam in Mathematics and Physics. The marks obtained in Mathematics(say X) are 67, 50, 76, 58, 65, 56, 71, 78, 62, 53, and in Physics(say Y) are 60,62,71,63,59,73,60,51,74,68. Construct a bivariate frequency table by taking class intervals 50-55, ... etc. for both the subjects. Find marginal frequency distribution and conditional frequency distribution of Y when X lies between 60-65. **(10)** **CO2**

6. Answer any one of the following-

a. In a bolt factory machines A, B and C manufacture respectively 20%,30%, and 40% of the total. Of their output 4,5,2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A,B and C? **(10)** **CO3**

b. (i) Given two independent events A and B. Show that A' and B' are also independent. (A' and B' are complements of A and B respectively.) **(10)** **CO3**

(ii) A box contains 5 bad and 6 good tubes. Two are drawn out from the box at a time. One of them is tested and found to be good. What is the probability that the other one is also good?

7. Answer any one of the following-

a. (i) Two samples of sizes 8 and 10 are drawn from two normally distributed population having variances 16 and 25. If the sample variances are 20 and 8, determine whether the first sample has a significantly larger variance than the second sample at significance level of (ia) 0.05 and (ii) 0.01. [Given F(0.05,7,8) = 3.29 and F(0.01,7,9) = 5.61] **(10)** **CO4**

(ii) The mean height of 500 students is 152cm and the standard deviation is 16 cm. Assuming that the heights are normally distributed, find how many students have heights between 120 and 164 cm? [Given P(0 > z > 2) = 0.4772 and P(0 > z > 0.75) = 0.2734]

b. (i) A continuous random variable X follows uniform distribution U(a,b) in a <x < b. Find the r^{th} moment about mean (central moment). What will be variance of U(a,b) ? **(10)** **CO4**

(ii) The following table gives the number of accidents that took place in an industry during days of the week. Test if accidents are uniformly distributed over the week. [Given Chi-square value at 5% with 5 degree of freedom is 11.09].

Day	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
No. of accidents	14	12	18	15	14	11

8. Answer any one of the following-

a. (i) If $y = acos(logx) + bsin(logx)$,prove that $x^2y_2 + xy_1 + y = 0$. **(10)** **CO5**

(ii) Evaluate $\iint (x^2 + y^2)dxdy$ over the region in the positive quadrant for which $x + y \leq 1$.

b. (i) Find the value of x at which the function sinx(1+cosx) will be maximum. **(10)** **CO5**

(ii) A thin plate covers the triangular region bounded by the x-axis and the lines x = 1 and y = 2x in the first quadrant. The plates density at the point s(x, y) is 6(x + y + 1). Find the plates mass, first moment and centre of mass.