R19

Code No: 861AD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA I Semester Examinations, January - 2020
COMPUTER ORIENTED STATISTICAL METHODS

Time: 3hrs **Max.Marks:75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 ×5 Marks = 25

1.a) i) An urn contains 5 red balls and 2 green balls. Two balls are drawn one after the other. What is the probability that the second ball is red?
ii) In screening for a certain disease, the probability that a healthy person wrongly gets a positive result is 0.05. The probability that a diseased person wrongly gets a negative result is 0.002. The overall rate of the disease in the population being screened is 1%. If my test gives a positive result, what is the probability I actually have the disease? [2+3]

b) Derive mean and variance for a poison distribution. [5]

c) The marks obtained in statistics in a certain examination found to be normally distributed. If 5% of the students ≥ 60 marks, 40% < 30 marks. Find the mean and standard deviation. [5]

d) A sample of size 100 is taken whose standard derivation is 10 and the mean is 80. Find 99% confidence interval. [5]

e) If the two regression lines are $y = 0.4x + 10.21$ and $x = 102y - 17.3$. Find i) the coefficient of correlation ii) the means of x and y. [5]

PART - B

5 × 10 Marks = 50

2.a) A manufacturer claims that its drug test will detect steroid use (that is, show positive for an athlete who uses steroids) 95% of the time. Further, 15% of all steroid-free individuals also test positive. 10% of the rugby team members use steroids. Your friend on the rugby team has just tested positive. What is the probability that he uses steroids?

b) An aircraft emergency locator transmitter (ELT) is a device designed to transmit a signal in the case of a crash. The Altigauge Manufacturing Company makes 80% of the ELTs, the Bryant Company makes 15% of them, and the Chartair Company makes the other 5%. The ELTs made by Altigauge have a 4% rate of defects, the Bryant ELTs have a 6% rate of defects, and the Chartair ELTs have a 9% rate of defects
(i) If an ELT is randomly selected from the general population of all ELTs, find the probability that it was made by the Altigauge Manufacturing Company.
(ii) If a randomly selected ELT is then tested and is found to be defective, find the probability that it was made by the Altigauge Manufacturing Company. [5+5]

OR

3.a) A random variable X has the density function
$f(x) = c/(x^2 + 1)$, where $-\infty < x < \infty$
i) Find the value of the constant c. (ii) Find the probability that X lies between 1/3 and 1.

b) Suppose the random variables X and Y have the joint density function defined by

$$f(x,y) = \begin{cases} c(2x+y), & 2<x<6,\ 0<y<5 \\ 0, & otherwise \end{cases}$$

Then find i) c
ii) Marginal density of X and Y
iii) Conditional density function of Y given X = 2. [5+5]

4.a) A coin is tossed until a head appears. What is the expectation of number of tosses?

b) Suppose that X assumes that values 1 and -1, each with probability 0.5. Find and compare the lower bound on P [-1 < X <1] given by Chebyshev's inequality and the actual probability that -1 < X < 1. [5+5]

OR

5.a) Bob is a high school basketball player. He is a 70% free throw shooter. That means his probability of making a free throw is 0.70. During the season, what is the probability that Bob makes his third free throw on his fifth shot?

b) Determine the variance of the geometric distribution whose probability function is $P(X=k) = q^{k-1}p$ [5+5]

6.a) Define Gamma, Beta and Lognormal distributions.

b) Problem: The annual maximum runoff Y of a certain river can be modeled by a lognormal distribution. Suppose that the observed mean and standard deviation of Y are 300 cfs and 200 cfs. Determine the probability P(Y > 400 cfs). [5+5]

OR

7. A population consists of six numbers 4, 8, 12, 16, 20, 24, consider all samples of size two which can be drawn without replacement from this population. Find
   a) The population mean
   b) The population standard deviation.
   c) The mean of the sampling distribution of means
   d) The standard deviation of the sampling distribution of means verify and, (c) and (d) from (a) and (b) by one of suitable formula. [10]

8.a) The times of 8 runners in a randomly selected heat of the 100 m sprint in the Olympic Games had a mean time of 9.84 s and a standard deviation of 0.08 s. Calculate (correct to two decimal places) 99.9% confidence limits for the mean time of all the 100m runners at the Olympic Games.

b) Find the 99% tolerance limits that will contain 95% of the metal pieces produced by the machine, given a sample mean diameter of 1.0056 cm and a sample standard deviation of 0.0246. [5+5]

OR

9.a) It is believed that the average level of prothrombin in a normal population is 20 mg/100 ml of blood plasma with a standard deviation of 4 milligrams/100 ml. To verify this, a sample is taken from 40 individuals in whom the average is 18.5 mg/100 ml. Can the hypothesis be accepted with a significance level of 5%?

b) A personal manager claims that 80 percent of all single women hired for secretarial job get married and quit work within two years after they are hired. Test this hypothesis at 5% level of significance if among 200 such secretaries, 112 got married within two years after they were hired and quit their jobs. [5+5]

10.a) The sales of a company (in million dollars) for each year are shown in the table below.

x (year)	2015	2016	2017	2018	2019
y (sales)	12	19	29	37	45

i) Find the linear regression $y = ax+b$

ii) Use the least squares regression line as a model to estimate the sales of the company in 2022.

b) If θ is the angle between two regression lines and S.D. of Y is twice the S.D. of X and $r = 0.25$, find $\tan\theta$. [5+5]

OR

11.a) The tangent of the angle between two regression lines is 0.6 and if $\sigma_x = (\frac{1}{2})\sigma_y$. Find the correlation coefficient between x and y.

b) Fit an exponential curve of the form $y = ae^{bx}$ for the following data [5+5]

X	10	15	13	10	23	27
Y	14	12	15	15	20	30

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