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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 19EC5PE1PS **Max Marks: 100**
Course: Probability and Statistics

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) In a certain market, only two brands of cold drinks A and B are sold. Given that a man last purchased brand A, there is 80% chance that he would buy the same brand in the next purchase, while if a man purchased brand B, there is 90% chance that his next purchase would be brand B. **10**

i. Develop Transition Probability Matrix

ii. Interpret the state transition matrix is terms of (1) Retention & loss
(2) Retention & gain

iii. Draw Transition diagram.

b) Three balls are randomly chosen from an urn containing 3 white, 3 red, and 5 black balls. Suppose that we win Rs1 for each white ball selected and lose Rs1 for each red ball selected. Let X be the total winning of the experiment. Find the pmf of X and E [X] **10**

UNIT - II

2 a) A random process X(t) is determined by tossing two dice to determine which of the following sinusoid to pick. **10**

$$X(t) = \begin{cases} x_{1(t)} = sint & if\ the\ sum\ is\ 3\ or\ 7 \\ x_{2(t)} = cos2t & if\ the\ sum\ is\ 2\ or\ 12 \\ x_{3(t)} = sin2t & otherwise \end{cases}$$

$$\text{Find } \mu_x\left(\frac{\pi}{4}\right),\ \mu_x\left(\frac{\pi}{2}\right),\ \sigma_x^2\left(\frac{\pi}{2}\right),\ \sigma_x^2\left(\frac{\pi}{4}\right)$$

b) A random variable process is given X(t) = Acosωt+Bsinωt , ω is constant, A and B are independent random variables having zero mean and variance σ^2. Find mean and autocorrelation function of X(t). **06**

c) Discuss the properties of cross correlation function. **04**

UNIT - III

3 a) Find the least square straight line for the following data and estimate y at x=4 and x at y=4. **06**

x	y
1	6
2	4
3	3
4	5
5	4
6	2

b) Define correlation? Explain the different types of correlation with example. **06**

c) In a partially destroyed lab record only the lines of regression are available that is 8x – 10y +66=0 and 40x – 18y =214. **(Variance of X=9)** Calculate i) the mean of X and Y ii) correlation coefficient between X and Y iii) Standard deviation Y **08**

OR

4 a) Find the equation of the best fitting straight line y=a+bx for the following data & hence estimate the value of the dependent variable corresponding at the value 30 of the independent variable. **12**

x	y
5	16
10	19
15	23
20	26
25	20

b) What is regression and lines of regression? Write the comparison between correlation and regression? **08**

UNIT - IV

5 a) Elaborate the Characteristics of the Chi-Square Distribution and explain Chi-square test for goodness of fit. **08**

b) A population consists of four numbers (3, 8, 10, 15). Consider all possible sample of size 2 that can be drawn without replacement from the population. **12**
Find the following:
a. Population Mean
b. Population Variance
c. Population Standard Deviation
d. The Mean of the sampling distribution of means
e. The Standard deviation of the sampling distribution of means

OR

6 a) i. An electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed, with mean equal to 800 hour and standard deviation of 40 hours. Find the probability that a **12**

random sample of 16 bulbs will have an average life of less than 775 hours.

ii. The contents of seven similar containers of medicine are 9.8, 10.2, 10.4, 9.8, 10.0, 10.2 and 9.6 litres. Find a 95% confidence interval for the mean of all such containers, assuming an approximate normal distribution

iii. In a random sample of 500 families owning television sets in the city of Lusaka, Zambia, it was found that 340 owned colour sets. Find a 95% confidence interval for the actual proportion of families in this city with colour sets.

b) What are Type I and Type II errors? What are the properties of Type I and Type II errors? **08**

UNIT - V

7 a) State the null and alternative hypothesis and the average weight of all residents in town XYZ is 168 lbs. A nutritionist believes the true mean to be different. She measured the weight of 36 induvial and found the mean to be 169.5 lbs with a standard deviation of 3.9. **10**

a. State the null and alternate hypothesis.

b. At a 95% confidence level, is there enough evidence to discard the null hypothesis

c. Use both z-test and p-value test.

b) Describe how the Neyman-Pearson lemma is applied to construct the best test of the hypothesis? **10**

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