OBE

REFNO035111

M.Sc. SEMESTER - I EXAMINATION 2020-21

COMPUTER SCIENCE

CS-201 : Probability and Statistics for Computer Science

Time : Four hours **Max. Marks : 70**

Instructions

1. **The Question Paper contains 08 questions out of which you are required to answer any 04 questions. The question paper is of 70 marks with each question carrying 17.5 marks.**

2. The total duration of the examination will be **4 hours** (Four hours), which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-written answer sheets on the portal.

3. For the students with benchmark disability as per Persons with Disability Act, the total duration of examination shall be **6 hours** (six hours) to complete the examination process, which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-written answer sheets on the portal. .

4. Answers should be hand-written on a plain white A4 size paper using black or blue pen. Each question can be answered in upto 350 words on 3 (Three) plain A4 size paper (only one side is to be used).

5. Answers to each question should start from a fresh page. All pages are required to be numbered. You should write your Course Name, Semester, Examination Roll Number, Paper Code, Paper title, Date and Time of Examination on the first sheet used for answers.

Questions

1. Answer the following questions:

a. The density function of a random variable X is given as below: **[10]**

$$f(x) = \begin{cases} Ke^{-x}, & x \geq 0 \\ 0, & otherwise \end{cases}$$

Find the value of K, mean and variance.

b. The probability that the life of a bulb working for 10 years is 0.03. Find the probability that out of 10 bulbs (i) at least one, (ii) greater than 5, (iii) exactly one and (iv) none will work for 10 years. **[7.5]**

2. Answer the following questions:

a. In a class 5% of the boys and 10% of the girls have an IQ of more than 150. In this class 60% of the students are boys. If a student is selected at random and found to have an IQ more than 150, find the probability that the student is a boy. **[6]**

b. Find the mean and variance of Poisson distribution. **[6]**

c. A coin is tossed 10 times; find the probability of getting 3 or 4 heads. **[5.5]**

3. Answer the following questions:

a. The joint density function of random variables (X,Y) is given by: **[10]**

$$f(x,y) = \begin{cases} \frac{1}{24}xy, & 1 \leq x \leq 3, \quad 2 \leq y \leq 4 \\ 0, & otherwise \end{cases}$$

Find the conditional densities of X given Y and Y given X.

b. In a test given to two groups of students, the scores obtained are as follows: **[7.5]**

Group 1	23	11	19	26	35	46	53	18	36
Group 2	31	18	21	31	48	40	18	23	30

i. Which group is more consistent?

ii. Find the combined mean and standard deviation.

4. Answer the following questions:

a. Calculate the mean, median and mode from the following data: **[5]**

Marks	0	10	20	30	40	50	60	70	80
No. of Students	1	9	26	59	72	52	29	7	1

b. Prove that the sum of the squares of the deviations of a set of observations is minimum when taken about mean. **[5]**

c. X and Y are two random variables with variance $\sigma^2{}_x$ and $\sigma^2{}_y$ respectively and r is the coefficient of correlation between them. If $U = X + kY$ and $V = X + \frac{\sigma_x}{\sigma_y}Y$, find the value of k so that U and V are uncorrelated. **[7.5]**

5. Answer the following questions:

a. A bag contains 8 items of which 2 are defective. A man selects 3 items at random. Find the expected number of defective items he has drawn. **[5]**

b. The joint probability mass function of two random variables X and Y is given as:
P(X=0, Y=0) = ½, P(X=1, Y=0) = 1/8, P(X=0, Y=1) = 1/8 and P(X=1,Y=1) = 1/4. Compute the
(i) covariance of X and Y
(ii) P(X+Y<= 1) **[10]**

c. State Baye's Theorem and its application. **[2.5]**

6. Answer the following questions:

a. An electric firm manufactures light bulbs that have a life, before burn-out, that is normally distributed with mean equal to 800 hours and a standard deviation of 40 hours. Find the probability that a bulb burns between 778 and 834 hours. **[8.5]**

b. In a certain industrial facility, accidents occur frequently. It is known that the probability of an accident on any given day is 0.005 and accidents are independent of each other. What is the probability that in any given period of 400 days, there will be an accident on one day? What is the probability that there are at most three days with an accident? **[9]**

7. Answer the following questions:

a. The chances of A, B and C becoming manager of a company are 4:2:3. The probability that bonus scheme will be introduced if A, B and C are managers are 0.3, 0.5 and 0.8. The bonus scheme was introduced. What is the probability that A is the appointed manager? **[10]**

b. Suppose X ~ Bin(n, 0.5). Find the probability mass function of Y = 2X. **[3.5]**

c. Suppose that a random variable X takes values between 0 and 1 and has probability density function $2x$. Calculate
(i) Var(X) and
(ii) Var(X^2). **[4]**

8. Answer the following questions:

a. Compute the mean and variance of the number of tails that appear in 3 flips of a fair coin. **[3.5]**

b. Suppose that P(A) = 0.4, P(B) = 0.3 and $P((A \cup B)^c) = 0.42$. Are A and B independent? **[4]**

c. Prove that the value of the coefficient of correlation 'r' lies between -1 and 1. **[10]**

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