7/12/23

VCD/ FYBSC-SEM I – STATISTICS II – 100 MARKS - 3 HRS

NOTE : 1) All questions are compulsory.

2) Use of calculator is allowed.

Q.1. (a) State true and false, with justification. **[Each 2 marks]**

1. A discrete random space must contain a finite number of elements.
2. If A' and B are independent, then A and B are independent.
3. Kurtosis explains peakedness.
4. With usual notation $Cov(aX + b, cY + d) = ac\, Cov(X, Y) + bd$.
5. Poisson distribution is always negatively skewed.

(b) Answer in one line. **[Each 2 marks]**

1. Give an example of (i) mutually exclusive (ii) exhaustive event.
2. State multiplicative theorem for three events.
3. Define probability mass function of random variable X.
4. Define covariance between two random variable.
5. Define bernoulli experiment.

Q.2 Attempt any TWO. **[Each 10 marks]**

(1) State and prove Bayes' theorem.

(2) (a)Explain the concept of conditional probability.

(b) Define pair-wise independence and total independence.

(3) (a) Suppose a card is drawn from a well shuffled pack of cards. Let event A: getting heart card and B: getting queen. Are A and B independent?

(b) A husband and a wife appear for two vacancies in the same post. The probability of husbands selection is 1/6 and wife's selection is 1/5 , what is the probability that (i) both will be selected (ii) only one of then would be selected (iii) none of them would be selected?

Q.3 Attempt any TWO. **[Each 10 marks]**

(1) Define Cumulative distribution and its Properties. And prove E(aX+b) = aE(X) + b.

(2) Define covariance between two random varibles. State and prove its properties.

(3) If bivariate probability mass function is given by

$P_{X,Y}(x, y) = K(2x + y)$ x,y = 2,3,4

= 0 Otherwise

Obtain the value of K. Also obtain marginal p.m.f. of X and Y. and conditional p.m.f. of X given Y = 2.

Q.4 Attempt any TWO. **[Each 10 marks]**

(1) (a) If a random variable X follows binomial distribution with parameters (n,p), Obtain expression for its mean & variance.

(b) If a random variable X follows Poisson distribution with parameters λ, Obtain expression for its mean & variance.

(2) (a) If a discrete random variable X has uniform distribution over the range {1,2,3,..,n}. And its mean is 12.5 find n and its variance.

(b) For binomial variate X with parameter (n,p); p=q and P(X=2) = P(X=3),Find (i) P(X=1) (ii) P(X > 1)

(3) (a) If random variable X follows Poisson distribution , if P(X=5) = 0.3 P(X=4) then find mean and P(X > 3).

(b) A small voting district has 101 female voters and 95 male voters. A random sample of 10 voters is drawn.What is the probability that exactly 7 of the voter will be female? (using hypergeometric distribution).

Q.5 Attempt any TWO. [Each 10 marks]

(1) State and prove the addition theorem of probability concerning 2 events A and B.

(2) (a)If bivariate p.m.f is given by

$$P_{X,Y}(x,y) = kxy \qquad x,y = 1,2,3$$

$$= 0 \qquad ; \text{ otherwise}$$

Obtain the value of k. also obtain marginal probabilities of X and Y. Are X and Y independent?

(b) Consider the experiment of tossing four unbiased coins. The random variable X is number of heads observed and Y be the number of heads observed in a sequence. Then write down joint probability mass function of X,Y. Hence their maginal probability, also obtain conditional p.m.f. of X given Y = 2.

(3) (a) An unbiased dice is rolled. Write down the p.m.f for the number on the uppermost face. Obtain its mean and variance.

(b) A box contain 10 balls of which 6 are red and 4 are white. Two balls are selected at random. If X denotes number of white balls selected then write down p.m.f. of X and also state mean and variance of X.

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