## Seat No. :

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JI-103<br>June-2022<br>B.Sc., Sem.-II<br>103 : Statistics<br>(Probability Theory)<br>(New)

Time : 2 Hours]
[Max. Marks : 50

## SECTION - I

Attempt any Three :

1. (A) Explain the following terms:
(1) Mutually exclusive events
(2) Union event
(3) Random experiment
(4) Difference event
(B) A number is taken at random from the numbers 1 to 100 . Find the probabilities that the number is divisible by (i) 3 (ii) 7 (iii) 3 or 7 .
2. (A) State and prove Baye's theorem.
(B) What is favourable cases? Prove that $0 \leq \mathrm{P}(\mathrm{A}) \leq 1$.
3. (A) Write a definition of distribution function and write properties of it.
(B) What is moment generating function? Derive the moment generating function of random variable X with probability mass function $\mathrm{P}(x)=3(2)^{-2 \mathrm{x}} ; x=1,2,3, \ldots$.
4. (A) Write the properties of Expectation of random variables.
(B) Using probability generating function $G_{x}(t)=\frac{3}{4-t}$ find the mean and variance of X.
5. (A) State and prove Boole's inequality.
(B) State and prove Bonferroni's inequality.
6. (A) State and prove Markov's inequality.
(B) Explain concave function.
7. (A) Define joint probability mass function, joint probability density function, conditional expectation and conditional variance.
(B) What is product moments? Explain in detail.
8. (A) Explain marginal and conditional probability functions. And also prove that $\mathrm{E}(\mathrm{X}+\mathrm{Y})=\mathrm{E}(\mathrm{X})+\mathrm{E}(\mathrm{Y})$ where X and Y is a random variable with joint probability function $f(x, y)$.
(B) For the joint probability distribution of two random variables X and Y are given below: $\quad Y$

| $\mathbf{X}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ |
| :---: | :---: | :---: | :---: | :---: |
| 1 | $4 / 36$ | $3 / 36$ | $2 / 36$ | $1 / 36$ |
| 2 | $1 / 36$ | $3 / 36$ | $3 / 36$ | $2 / 36$ |
| 3 | $5 / 36$ | $1 / 36$ | $1 / 36$ | $1 / 36$ |
| 4 | $1 / 36$ | $2 / 36$ | $1 / 36$ | $5 / 36$ |

Find
(i) the marginal distribution of X and Y
(ii) conditional distribution of X and Y
(iii) conditional distribution of X given X .

## SECTION-II

9. Attempt any Eight :
(1) Distribution function is a bounded function between $\qquad$ .
(a) 1,0
(b) 0,1
(c) 2,0
(d) None of the above
(2) Which of the following experiment does not have equally likely outcome?
(a) Choose a number at random from 1 to 7
(b) Toss a coin
(c) Choose a letter at random from the word SCHOOL
(d) None of the above
(3) Second cumulants gives us $\qquad$ .
(a) mean
(b) standard deviation
(c) variance
(d) None of the above
(4) The $\qquad$ cumulant is effected by change of origin and scale both.
(a) second
(b) third
(c) fourth
(d) first
(5) Bowely's coefficient of skewness is based upon $\qquad$ .
(a) deciles
(b) quartiles
(c) percentiles
(d) None of the above
(6) Number of students in an examination is an example of $\qquad$ random variable.
(a) discrete
(b) continuous
(c) Both of the above
(d) None of the above
(7) Which of the following are mutually exclusive event when a single card is chosen at random from a standard deck of 52 playing cards ?
(a) Choosing a 7 or choosing a club
(b) Choosing a 7 or choosing a jack
(c) Choosing a 7 or choosing a heart
(d) None of the above
(8) The full form of CDF is
(a) Cumulative Distribution Function
(b) Crime Density Function
(c) Creamy Distribution Function
(d) None of the above
(9) If mean $<$ median $<$ mode then it is $\qquad$ skewed distribution.
(a) positive
(b) negative
(c) Both of the above
(d) None of the above
(10) If the distribution is continuous then we use $\qquad$ .
(a) PMF
(b) PGF
(c) PDF
(d) None of the above
