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DEPARTMENT OF STATISTICS
Class:-B.Sc-I
Paper-IV (Discrete Probability Distributions)
Question Bank

……………………………………………………………………………………………

Q. 1) Choose a correct alternative for each of following.

1) A function which generates probabilities is ……
   A) Mean B) Variance
   C) Probability generating function D) cann't be defined

2) The Variance of binomial distribution is….
   A) npq B) $\sqrt{npq}$ C) np D) $\sqrt{np}$

3) The range of correlation coefficient is lies between …..
   A) $-\infty\le\rho\le\infty$ B) $-1\le\rho\le1$
   C) $0\le\rho\le1$ D) $-\infty\le\rho\le0$

4) If X & Y are any two random variables then COV (aX+h, cY+d) Where a,b,c,d are constants is……..
   A) COV(X, Y) B) ac COV(X, Y)
   C) abcd COV(X,Y) D) ac COV(X,Y) + cd

5) The variance of one point distribution is always…..
   A) Zero B) One
   C) Constant D) None of these

6) The p.g.f of a r.v. X is P(s) then the p.g.f of X+3 is
   A) $s^3P(s)$ B) $P(s) + s^3$ C) P(s+3) D) P(3s)

7) The COV(X, X) is….
   A) V(X) B) E(X) C) Zero D) Constant

8) Hypergeometric distribution tends to binomial distribution with parameter n& p if…
   A) N=M B) $N\to\infty$ C) N=0 D) N=N

9) Let X be a r.v. then V(aX) is……

A) aV(X)
B) V(X)
C) $a^2V(X)$
D) 0

10) The distribution function of a discrete random variable is…..

A) Non increasing B) Non decreasing C) Not constant D) not exponentail

11) If X & Y are independent random variable then P(X/Y)=…..

A) P(X)
B)P(Y)
C) P(X, Y)
D) None of these

12) If X has one point distribution with P(X=1)=1 and 0 otherwise then E(X) is…

A) 0 B) 1 C) 0.25 D) None of these

13) The expectation of a number of a throw of a single die is….

A) 3 B) 7/2 C) 1/6 D) 140

14) Extension of Bernoulli's distribution is….. distribution.

A) Uniform
B) Hypergeometric
C) Binomial
D) Two-Point

15) If X is discrete random variable with mean E(X) then $E[X-E(X)]^2$

A) Mean B) Variance C) S.D D) Raw moment

16) A random variable is a ……defined on sample space.

A) Probability B) Function C) Constant D) Variable

17) If E(XY)=E(X)·E(Y) then identify the relationship between X & Y. They are….

A) Independent
B) Correlated
C) Uncorreated
D) Dependent

18) Bayes' theorem is sometimes known as the probability of….

A) Effects
B) Causes
C) Results
D) Events

19) If X & Y are two independent random variables then the Probability generating function of X+Y is…..

A) $P_x(s).P_y(s)$
B) $P_x(s) +P_y(s)$
C) $P_x(s)- P_y(s)$
D) None of these

20) The value of joint distribution function F(x,y) lies within the limits …..

A) -1& 1 B) -1 & 0 C) -∞ & 0 D) 0&1

21) The sample of all experiment consist of n points. It's a Power set will contain the following no. of points……

A) 2^n
B) 2n+1
C) 3^n
D) None of these

22) If A & B are independent then P(A∩B)=……

A) P(A)+P(B)
B) P(A)-P(B)
C) P(A)*P(B)
D) $P(A) * P(\bar{B})$

23) If X & Y are two independent random variables with means 6 & 5 respectively then E(XY) =…..

A) 11 B) 30 C) 36 D) 25

24) A random variable X is said to be discrete if the sample space of X has …. Sample points

A) Finite
B) Countably infinite
C) Finite or countably infinite
D) Uncountably infinite

25) If E(XY)=E(X)·E(Y) then identify the relationship between X & Y. They are….

A) Independent
B) Correlated
C) Uncorreated
D) Dependent

26) If X is a discrete r.v. which takes only one value, say C with probability 1 then

A) E(X) = 0 , var(X) = 0
B) E(X) = C , Var(X) = C
C) E(X) = X , Var(X) = C
D) E(X) = C , Var(X) = 0

27) If X is a discrete r.v. , the expected value of SX , for |S| ≤ 1 is known as -----

A) Probability distribution function
B) Characteristic function
C) Probability generating function
D) Moment generating function

28) The p.g.f. of discrete r.v. X is $0.5 + 0.3S + 0.2S^3$. Then E(X) is-------.

A) 0.9 B) 1 C) 1.5 D) 0.5

29) The graph of …….. A discrete r.v is a step function

A) Distribution function
B) Probability function
C) Both discrete and probability function
D) None of the these

30) If X takes value 1,2 with P(X=1) = 0.2 and E(X) = 2.2 then P(X=2) is ……..

A) 0.5 B) 0.1 C) 0 D) 1

31) Given E(X) = 5 and E(Y) = -2, then E(X – Y) is…….

A) 3 B) 5 C) 7 D) –2

32) The range of binomial distribution is:
A) 0 to n B) 0 to ∞ C) -1 to +1 D) 0 to 1

33) The mean and standard deviation of the binomial probability distribution 'are respectively:
A) np and npq B) np and $\sqrt{npq}$ C) np and nq D) n and p

34) The hypergeometric distribution has:
A) One parameter B) Two parameters
C) Three parameters D) Four parameters

35) In a hypergeometric distribution N=6, n=4 and M=3, then the mean is equal to:
A) 2 B) 4 C) 6 D) 24

36) For the following distribution

X :	0	1	2
P(x) :	k	5k	4k

The value of k is ……
A) 1 B) ½ C) ¼ D) 1/10

37) If P(x) is p. m. f. of a discrete r. v. X, then Σ p(x) is equal to ……..
A) One B) Zero C) Infinity D) None of these

38) If r. v. X takes values -1, 0, 1 with probabilities 0.3, 0.4, 0.3 respectively, then |X| takes values with probabilities
A) (0.5, 0.5) B) (0.4, 0.6) C) (0.6, 0.4) D) None of these

39) From the distribution function we can find
A) Mean B) Median C) Mode D) None of these

40) Let (X, Y) be the bivariate random variable with joint p.m.f. P(x, y). If X and Y are independent random variables then ……..
A) E(X+Y) = E(X) + E(Y) B) E(XY) = E(X).E(Y)
C) E(X/Y) = E(X) / E(Y) D) All the above

41) Let (X, Y) be the bivariate random variable and Y = aX+b then E(Y) =…..
A) E(X) B) aE(X) C) aE(X) + b D) None of the above

42) Let (X, Y) be the bivariate random variable and Y = aX+b then V(Y) =…..
A) V(X) B) aV(X) C) aV(X) + b D) a^2 V(X)

43) If X and Y are two random variables, then covariance between them is ……
A) Cov(X,Y) = E{[X-E(X)][Y-E(Y)]} B) Cov(X,Y) = E(XY) – E(X) E(Y)

C) Both A) and B) D) None of the above

44) If X and Y are two random variables, then V(X + Y) = ……..

A) V(X) + V(Y)
B) V(X) – V(Y)
C) V(X) + V(Y) + 2 Cov(X,Y)
D) V(X) + V(Y) - 2 Cov(X,Y).

45) The variance of one point distribution is always……….

A) Zero B) One C) Constant D) None of the above

46) The mean of uniform distribution is……..

A) $\frac{(a-b)}{2}$ B) $\frac{(a+b)}{2}$ C) $\frac{(a+2b)}{2}$ D) None of the above

47) The mean and variance of Bernoullli's distribution is……..

A) np and npq B) p and q C) p and pq D) pq and p

48) For ………distribution P(X = k) = 1

A) Two point B) One Point C) Bernoulli D) Uniform

49) In binomial distribution the numbers of trials are:

A) Very large B) Very small C) Fixed D) Not fixed

50) A Bernoulli trial has:

A) At least two outcomes
B) At most two outcomes
C) Two outcomes
D) Fewer than two outcomes

Q.2) Long answer questions.

1) Define cumulative distribution function. State & Prove properties of distribution function.

2) Explain the following terms giving suitable illustrations.

i) Random variable
ii) Discrete random variable
iii) Probability mass function of discrete random variable
iv) Distribution functionof discrete random variable

3) Define probability generating function (p.g.f.) of a random variable X. Then find mean and variance from p.g.f..

4) Explain Pearson's coefficients of skewness and kurtosis.

5) If a random variable X has the p.g.f. $P_x(s) = \left(\frac{ps}{1-qs}\right)^n$ where p+q = 1 and |s| < 1, find the mean & variance of X.

6) Define Binomial distribution and find its mean & variance.

7) Find p.g.f. of Binomial distribution and hence find mean & variance.

8) Define Hypergeometric distribution and find its mean & variance.

9) Define the term
   - i) Probability distribution of (X, Y)
   - ii) Distribution function of (X, Y)
   - iii) Marginal probability distribution of X and Y
   - iv) Conditional Probability distribution of X and Y
   - v) Independence of two random variables

10) Prove that,
   - i) $E(X \pm Y) = E(X) \pm E(Y)$
   - ii) $E(XY) = E(X) \cdot E(Y)$ when X and Y are independent

Q.3) Short answer questions.

1) Derive the relation between distribution function andprobability mass function.

2) Construct a discrete random variable on a sample space of tossing of three fair coins.

3) Define the following terms
   - i) Probability mass function.
   - ii) Median
   - iii) Mode

4) Let $(X = x) = \frac{x+1}{10}$, for $x = 0, 1, 2, 3$. Verify whether P(X) is probability mass function. If it is so, find the distribution function of X. Also evaluate $P(0 < X < 3)$ and $P(X \leq 2)$.

5) Define mean & variance of a random variable and prove that
   $V(X) = E(X^2) - [E(X)]^2$

6) Define mean & variance of a random variable and find the effect of change of origin and scale on them.

7) Define probability generating function (p.g.f.) of a random variable X. What is the effect of change of origin and scale on p.g.f..

8) If a and b are constants, prove that
   - i) $E(a) = a$
   - ii) $E(aX+b) = aE(X) + b$
   - iii) $V(aX+b) = a^2V(X)$

9) The probability distribution of X is as follows:

X	0	1	2	3	4
P(X=x)	k	3k	5k	2k	k

Find i) k ii) E(X) iii) Var(X) iv) $P(X \geq 2)$ v) Mode of X

10) Define one point distribution. Find its p.g.f. and hence, its mean & variance.

11) Define two point distribution. Find its p.g.f. and hence, its mean & variance.

12) Define Uniform distribution. Find its p.g.f. and hence, its mean & variance.

13) Define Bernoulli's distribution. Find its p.g.f. and hence, its mean & variance.

14) Define Bernoulli's distribution.
   i) Find its mean & variance
   ii) State & prove the additive property of Bernoulli's distribution

15) State & prove the additive property of Binomial distribution.

16) What is meant by fitting a distribution to the given data? Obtain recurrence relation for the probability of Binomial distribution.

17) Show that Binomial distribution is a limiting form of Hypergeometric distribution.

18) Obtain the recurrence relation of Hypergeometric distribution.

19) Define the term
   i) Covariance and Correlation of X & Y
   ii) Conditional mean & variance of X

20) An Urn contains 3 balls numbered 1, 2, 3 and two balls are drawn in succession. If X is the number on the first ball drawn and Y is the number on the second ball, find the probability distribution of (X, Y).

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