SEAT No.________

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SARDAR PATEL UNIVERSITY

B.Sc. Semester-IV Examination

Saturday, 15th October,2022

Time:-12:30 P.M. to 02:30 P.M.   Paper Code:- US04CSTA02   M.Marks:70

Subject:-Probability Distribution

Note:- Simple/Scientific calculators are allowed. Statistical Table is allowed.

Q.1. Multiple Choice Questions: - [10]

1 The coefficient of skewness for a binomial distribution will be zero if________.
(a) p<$\frac{1}{2}$ (b) p>$\frac{1}{2}$ (c)p =$\frac{1}{2}$ (d) p<q

2 A student randomly guesses at each of 8 multiple choice questions. Each question has 5 possible choices. The probability that the student gets exactly 4 correct is____.
(a) 0.115 (b) 0.227 (c) 0.046 (d) None of these

3 If Mx(t) = $(\frac{1}{3} + \frac{2}{3}\exp(t))^9$ is the m.g.f. of X then $\mu_1' =$______.
(a) 6 (b) 5 (c) 4 (d) 3

4 If X~N(μ ,σ^2) then $(\frac{x-\mu}{\sigma})$ has______.
(a) N(0 , 1) (b) N(0 ,σ^2) (c) χ_1^2 (d) χ_n^2

5 The ________ distribution has all odd order moments zero.
(a) Chi-square (b) Normal (c) Student's t (d) both(b) &(c)

6 If X and Y are two independent exponential variates with mean θ each, then Z =X+Y follows ____ distribution.
(a) G (2, θ) (b) G (2,2 θ) (c) G (1, θ) (d) none of these

7 If $S^2=\frac{\sum_{i=1}^{n}(X_i-\bar{X})^2}{n-1}$ is the sample variance of a random sample from N(μ ,σ^2)then $\frac{(n-1)S^2}{\sigma^2}$ ~___.
(a) χ_n^2 (b) χ_{n-1}^2 (c) χ_1^2 (d) none of these

8 If X~b(n,p) distribution then as n→∞, $(\frac{x-np}{\sqrt{npq}})$~_________.
(a) Standard normal (b) Poisson (c) Binomial (d) none of these

9 ____is the Median of the standard normal distribution.
(a) 0 (b) 1 (c) 2 (d) None of these

10 If X~N(0,1) and Y~ χ_r^2 variates and both are independent then $\frac{X}{\sqrt{\frac{Y}{r}}}$ ~ _____distribution.
(a) F(m , n) (b) F (r , 1) (c) t_r (d) χ_r^2

Q.2 Fill in the blanks: - [08]

1 The area under the normal curve between z=0 and z= 1 is _______ the area under the normal curve between z=-1 and z=0.

2 If X~F(m,n) distribution then the distribution of $\frac{1}{X}$ is ________.

3 The mean for the Gamma G(α,1) distribution is____.

4 The area under P(-2.25<Z<2.25) is_____.

State whether the statement is True or False.

5 The mean and variance of the Binomial distribution are equal.

(P.T.O.)

6 The shape of the Normal distribution is not symmetrical.

7 If X1 and X2 are two independent N(1,2) and N(2,2) variate then the distribution of Y=X1+X2 follows N(3,4) distributions.

8 Let X~U(2 ,a)variate with mean 5. The value of a is 5.

Q.3. Short Questions: - (Attempt any Ten) [20]

1 The mean and standard deviation of binomial distribution are 9 and 2 respectively. Find its parameter.

2 If f(x)= $\frac{1}{15}$, x=1,2,...15
= 0, otherwise is the p.m.f. of X. Find E(X) and E(2X+5).

3 Define Binomial distribution. State the condition under which Binomial distribution tends to Poisson distribution.

4 If X is uniformly distributed with mean 1 and variance 4/3, find P(X>0).

5 The length X of a component produced by a machine is a r.v. having the p.d.f,
f(x)= k(1-x) , 0<x<1
= 0, otherwise
Determine the value of k.

6 If $M_x\ (t) = (1-2t)^{-1}$, is the m.g.f. o a r.v. X then identify the distribution of X State its mean and variance.

7 The m.g.f. of a r.v. X is M(t)= $(0.55+0.45e^t)^{20}$ Find approximate value of P(3<x≤8).

8 If $M_x\ (t) = e^{25t(1+t)}$is the m.g.f. of a continuous r.v. X then name the distribution and writes its p.d.f.

9 If X~ P(64) then find P(X=80). State clearly the result you have used to solve the same.

10 If X~N(0,1) distribution then finds P(X^2 >3.84). State clearly, the result you have used to solve the probability.

11 Define F-distribution. Write the p.d.f. of F(2,2) distribution.

12 Define Chi-square distribution and Student t-distribution.

Q.4. Long Questions: - (Attempt any four) [32]

1 An urn contains 4 white and 3 black balls. If two balls are drawn at random (i) with replacement (ii) without replacement, find the probability that the selected balls containing (a) exactly 1 (b) atleast 1, black balls.

2 A test consists of 10 multiple choice questions, each with four possible answers, one of which is correct. To pass the test a student must get 60% or better on the test. If a student randomly guesses, what is the probability that the student will pass the test?

3 State the m.g.f. of Normal distribution. Obtain its c.g.f. and hence β_1 and β_2.

4 For a given p.d.f.
.f(x) = k$x^2\ (1-x)^3$, 0<x<1
= 0, otherwise
Find(i) k (ii) P(0.1 < X< 0.7) (iii) E(X^r)

5 If X1,X2,....,Xn are independent r.v.'s with m.g.f. Mx1(t), Mx2(t),..... Mxn(t) then prove that the m.g.f. of Y=$\sum_{i=1}^{n} Xi$ is given by My(t) =$\prod_{i=1}^{n} M_{Xi}$(t).

6 If X is N(μ , σ^2) variate. Show that Y= aX +b is N(aμ+b , $a^2\ \sigma^2$), a≠0.

7 If X has U[θ_1 - θ_2 , θ_1+θ_2]. Find θ_1 andθ_2 so that the mean and variance of X, are respectively equal to the mean and variance of $\chi^2_{(6)}$.

8 If $X_1, X_2, \ldots, X_{16}$ is a r.v. of size n=16 from N(50, 100), determine

(a)P($796.2 \leq \sum_{i=1}^{16}(Xi - 16)^2 \leq 2630$)

(b) P($726.1 \leq \sum_{i=1}^{16}(Xi - \overline{X})^2 \leq 2500$)

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