MATHS

SHORT ANSWERS :—

1. Explain Discrete random variables.

A. If the Random variable "x" taken only a finite (or) countable number of values then it is called Discrete Random variable

for ex— 1) No. of Head in tossing three coins.

2) No. of rooms in buildings.

2. If x_1, x_2 are two random variables and a, b are constants then $E(aX_1 + bX_2)$?

Sol:—

~~$E[ax+b] = aE[x]+b$~~.

$$E(ax_1+bx_2) = E(ax_1) + E(bx_2)$$
$$= aE[x_1] + bE[x_2]$$

3. The mean and variance of a binomial distribution are 6 & 3 respectively find the mode of the binomial distribution?

Sol:— $np = 6$

$npq = 3$

$$q = \frac{npq}{np} = \frac{3}{6} = \frac{1}{2}$$

$$p = 1 - q = 1 - \frac{3}{6} = \frac{1}{2}$$

$n \times \frac{1}{2} = 6$

$n = 12$

$(n+1)p - 1 \leq x \leq (n+1)p$

$\frac{13}{2} - 1 \leq 0 \leq \frac{13}{2}$ $\left[5.5 \leq 6 \leq 6.5\right]$ mode = 6

If x is a poisson variate such that $P(x=0) = P(x=1) = k$. Determine k.

Sol:- e^{-1}

$$P(X=x) = \frac{e^{-\lambda}\lambda^x}{x!}$$

$$P(X=0) = \frac{e^{-\lambda}\lambda^0}{0!} = e^{\lambda}$$

$$P(X=1) = \frac{e^{-\lambda}\lambda^1}{1!} = \lambda e^{-\lambda}$$

Given $P(X=0) = P(X=1) = k$

$\Rightarrow e^{-\lambda} = \lambda e^{-\lambda} = k$

$\Rightarrow e^{-1} = \lambda e^{-\lambda}$

$\therefore \lambda = 1$

$k = e^{-\lambda} = e^{-1}$

If $X = B(n, p)$ then write the conditions under which X tends to a poisson distribution

Sol:-

6. Define a random variable

Sol:- The process of assigning a numerical 'x' called random variable in other words Let 'x' be the sample space associated with random experiment a real value function.

7. Define binomial distribution.

Sol:- A random variable x is said to follow bynomial distribution if it assumes only non-negative values & x probability mass function is given by

$$p(x) = {}^{n}C_{x} \cdot p^{x} \cdot q^{n-x}, \quad x = 0, 1, 2 \ldots n$$

8. If the mean and variance of the binomial variate are 12 and 4 then write binomial distribution.

Sol:- $np = 12 \quad -(1)$

$npq = 4 \quad -(2)$

$(2) \div (1) \quad q = \frac{4}{12}$

$$p = 1 - q = 1 - \frac{4}{12} = \frac{1}{3}$$

$$n = \frac{12}{p} = 36.$$

9. List the property of probability distribution function

A. 1. $0 \leq P(x_i) \leq 1$

2. $P(x_1) + P(x_2) + \ldots + P(x_n) = 1$

The first.

10. Define poisson distribution?

Sol: A random variable 'x' is said to be follow a poission distribution if it assumes only non-negative values & its probability mass function is given by

$$p(x) = \frac{e^{-\lambda} \cdot \lambda^x}{x!} : x = 0, 1, \ldots \infty$$

11. If K is a constant, then what is the value of $E(ax+k)$?

Sol:-

1. Explain continuous random variable.

Sol:- A Random variable X which can take values continuously i.e, which takes all possible values in a given interval is called continuous random variable.

ex:- Height, age, time.

2. If $f(x) = \begin{cases} (x+1) & -1 < x < 1 \\ 0 \end{cases}$

find $E(x)$

Sol:- $E(x) = \int_{0}^{1/2} (x+1) \int_{-1}^{1} (x+1)$

$= (-1+1) ; (-1+1)$

$=$

3. If $f(x) = ke^{-x/5}$, $x > 0$ is a probability density function then find k?

Sol:-

4. If $f(x) = k(2x+3)$ in $0 < x < 2$, then find k.

Sol:

5. Write to application of normal distribution

Sol:- The normal distribution can be used to approximate binomial & poission distribution It has a wide use in testing statistical hypotesis & test of significance. It help us to estimate parameters from the statistic and to find confidence limits of parameters.

6. Write the probability density function of normal distribution?

Sol:- The general formula for the probability density function of the normal distribution is

$$f(x) = \frac{e^{-(x-\mu)^2/(2\sigma^2)}}{\sigma\sqrt{2\pi}} \quad (\text{or})$$

$$f(x, \mu, \sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-1}{2}\left(\frac{x-\mu}{\sigma}\right)^2},$$

7. If $\mu = 5$, and $\sigma = 2$, then write the p.d.f of the normal distribution

Sol:-

$\mu = 5$

$\sigma = 2$

8: Write the probability density function for the Standard normal variate.

Sol:- The Eq^n for the Standard normal distribution is

$$f(x) = \frac{e^{-x^2/2}}{\sqrt{2\pi}}$$

9. If $f(x) = k(2x^2)$ in $0 < x < 2$, then find k?

Sol:-

1. Define population and sample?

sol:- population is the total of statistical data forming a subject of investigation the no. of units in the population is called population. It is denoted by 'N'

A part of the population which is examine with a view to determine the population characteristics is called a sample. It is denoted by "n"

2. Define parameter and statistic?

A. parameter is a statistical method based on all units of pop^n mean (μ) std deviation (σ), pop^n variance (σ^2) population proportion (P).

statistic is a statistical measure based on all elements of sample. sample mean ($\bar{x}$) sample std deviation (s). sample variance (s^2), sample proportion (p).

3. Define std error of a statistic?

sol:- The standard of static 't' is the std deviation of the sampling distribution of the static i.e, S.E of sample mean is the std deviation of the sampling distribution of sample mean

$$S.E = \frac{\sigma}{\sqrt{n}}$$

4. Define Estimator & estimate?

Sol:- An estimate is a statement made to find an unknown pop'n parameter.

The procedure to determine an unknown pop'n parameter is called an estimator.

5. Define point estimation & Interval estimation.

A. If an estimate of the population parameter is given by a single value, then the estimate is called a point estimation.

If an estimate of a population parameter is given by two different value b/w which the parameter may be considered to lie, then the estimate is called an Interval Estimation

6. Find the pop'n correction factor if $n = 5$ & $N = 30$

Sol:- $\frac{N-n}{N-1} = \frac{30-5}{30-1} = \frac{15}{29}$ 4

7. Define type I error?

A. If type I error the null hypothesis is true but it is rejected by test procedure. Then the error made is called type I error.

8. Write the test statistic of single mean in Large samples?

A. If the size of the sample $n \geq 30$, then it is said to be Large sample.

9. Write about Null Hypothesis?

A. A Null hypothesis is the hypothesis which asserts that there is no significant difference between the statistic & population parameter. It is denoted by H_0 for

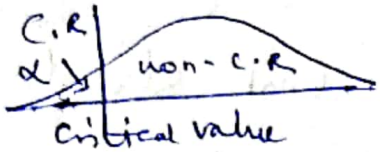
Ex:- $H_0 = \mu \neq \mu_0$.

10. What is mean by level of significance.

A. The Level of significant is the confidence which is we reject (or) accept the null hypothesis. It is denoted by α usually In practice we take either 5% (or) 1% Level of significants.

11. Define Left tailed test

A. If H_1 has $<$ sign, the critical region is taken in the Left side of the distribution



12. Write about alternative hypothesis?

A. Any hypothesis which contradics the null is called Alternative hypothesis It is denoted by H_a (or) H. for

Ex:- H_1, $\mu \neq \mu_0$.

13. Define critical region?

A. The critical region is formed based in the form of alternative hypothesis If AH HA has not Equal to sign. then the critical region is divided Equally In Left & Right tails if the form of H_A is $\neq$ sign. then the critical region is taken in Left tail. If AH HA is greater Sign then the critical region is taken on the right tail.

14. Define type II error?

A. If null hypothesis H_0 falls but it is accepted by test procedure then the error made is called type two Error.

15. Write the statistic of test for difference of two mean in Large samples.

A. The test statistic as

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

If $\sigma_1 = \sigma_2 = \sigma$

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\sigma^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

1. Find $t_{0.05}$ when $v = 16$.

Sol:- 1.7116.

2. Find $f_{0.01}(24, 9)$

Sol:- 2.47

3. write the one assumption of student's t-test

Sol:- Let $\bar{x}$ be the mean of a random sample of size n, taken from a normal population having the mean μ and the variance σ^2, and sample variance $s^2 = \sum \frac{(x_i - \bar{x})^2}{n-1}$, then

$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$ is a random variable having the t-distribution with $v = n - 1$ degree of freedom.

4. write one use of t-test

Sol:- 1. To test the significance of the sample mean, when population variance is not given.

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n-1}}$$

$\bar{x}$ = mean of the sample

n = size of the sample

σ = std. deviation.

μ = pop^{n} mean.

6. Write the one use of chi-square test?

Sol:- chi-square test is used to test whether diff b/w observed & expected frequency

Chi square test is mainly used to test an Independent of fit. we use this test to decide whether the diff b/w observed & expected frequency is Significant (or) not.

$$\chi^2 = \Sigma\left[\frac{(Oi - Ei)^2}{Ei}\right].$$

i. find $F_{0.05}$ with $v_1 = 7$ & $v_2 = 15$

Sol:- 2.91 (approx)

7. Write the formulae for significance of Single mean in t-test.

Sol:-

$$|t| = \frac{\bar{x} - \mu}{s/\sqrt{n-1}}$$

8. Write the formulae for significance of two means in t-test.

Sol:- $$|t| = \frac{\bar{x} - \bar{y}}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

9. Write the formulae for chi-square test

Sol:- $$\chi^2 = \Sigma\left[\frac{(O_i - E_i)^2}{E_i}\right]$$

10. Write the formula for F-test.

Sol:- $$F = \frac{S_1^2}{S_2^2} \quad (\text{or}) \quad \frac{S_2^2}{S_1^2}$$

$$F_{cal} = \frac{\text{Greater variance}}{\text{Smaller variance}}$$

11. Define Small sample?

Sol:- If the size of the sample $n < 30$, then it said to be Small sample (or) Exact Sample.

12. Find chi-square value for 1 degree of freedom at 5% level of significance.

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3. sum

1. Write C-R equations in Cartesian form?

Sol:- A necessary and sufficient condition of $f(z)$ is to be analytical then $\frac{\partial u}{\partial x}, \frac{\partial u}{\partial y}, \frac{\partial v}{\partial x}, \frac{\partial v}{\partial y}$ are continuous function.

2. Write the definition Harmonic function

3. Define Analytic function?

Sol:- A function $f(z)$ is set to be Analytical at the point z_0 if $f(z)$ differentiate at each of every point of the neighbourhood of z_0.

4. write the C-R eq'n in polar form.

Ans:

5. write the Statement of cauchy's theorem?

Ans: If a function $f(x)$ is analytic on and with in a simple closed ~~future~~ curve C, then $\int_C f(z)\,dz = 0$.

6. Evaluate $\int_0^{1+i} (x^2 + iy)\,dz$ along the path $y = x^2$

7. Write Generalized cauchy's Integral formula

Sol:- If $f(z)$ is analytic on and within a simple closed curve and $z=a$ is any point within 'c' then,

$$\int \frac{f(z)}{(z-a)^{n+1}} dz = \frac{2\pi i}{n!} f^n(a)$$

8. Find the value of $\oint_C \frac{e^z}{z-4} dz$ where C is $|z|=2$.

9. Write the definition conjugate Harmonic function

Sol:-

10. Define Laplace Equation

Sol:-

11. ~~Prove~~ Show that $u(x,y) = x^3 - 3xy^2$ is harmonic

12. Find 'k' such that $f(x,y) = x^3 + 3kxy^2$ be harmonic.

13. Using milne - thomson method find $f(z)$ given that $u(z) = 3x^2 - 3y^2 + 6ixy$.