I begin with the name of Allah,

Who is Most kind, Most Merciful.

<u>Sessional Assignment</u>

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Course: Probability and Statistics

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Program: BS(CS

Question 1:

Answer

Q:1 d

Ans: a Solution:

$$\text{mean} = np$$
$$4 = np$$
$$p = \frac{4}{n} \longrightarrow (1)$$

$$\text{Variance} = np(1-p)$$

$$9 = n\left(\frac{4}{n}\right)\left(1-\frac{4}{n}\right)$$

$$9 = 4\left(1-\frac{4}{n}\right)$$
$$9 = 4 - \frac{16}{n}$$

$$\frac{16}{n} = 4-9$$

$$\frac{16}{n} = -5$$

$$-5n = 16 \qquad \boxed{n = \frac{-16}{5}}$$

Put in eq (1)

$$p = \frac{4}{\frac{-16}{5}} = \frac{-20}{16}$$

$$\boxed{p = \frac{-5}{4}}$$

Hence $n = \frac{-16}{5}$ and $p = \frac{-5}{4}$

Ans: b

Critical region: A critical region, also known as the rejection region, is a set of values for the test statistic for which the null hypothesis is rejected i.e if ~~the hypothesis is rejected~~ the observed test statistic is in the critical region then we reject the null hypothesis and accept the alternative hypothesis.

Ans: C Properties of t- Distribution

1) Like, standard normal distribution the shape of the student distribution is also bell-shape and symmetrical with mean zero.
2) The student distribution ranges from $-\infty$ to ∞ (infinity)
3) The shape of the t-distribution changes with the change in the degrees of freedom.
4) The variance is always greater than one and can be defined only when the degrees of freedom $v \geq 3$ and is given as $Var(t) = [v/v-2]$

Date

5): It is less Peaked at the Center and higher in tails, thus it assumes Platykurtic shape

Ans: d

Analysis of variance (ANOVA) is an analysis tool used in statistics that splits an observed aggregate variability found inside a data set into two parts: systematic factors and random factors.
The systematic factors have a statistical influence on the given data set, while the random factors do not. Analysts use the ANOVA test to determine the influence that independent variables have on the dependent variable in a regression study.

Ans: c R.B.D

Randomized Block Design: With a randomized block design the experimenter divides subjects into subgroups called blocks, such that the variability within blocks is less than the variability between blocks.

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Ans: f

Statistical quality control, the use of statistical methods in the monitoring and maintaining of the quality of products and services. one method referred to as acceptance sampling can be used when a decision must be made to accept or reject a group of parts or items based on the quality found in a sample.

Ans: g

Chance Cause: A process that is operating with only chance causes of variation present is said to be in statistical control. In other words, the chance cause are an inherent part of the process.

Assignable cause: assignable cause is an identifiable specific cause of variation in a given process or measurment.

i

Ans: h

Traffic intensity: A measure of the average occupancy of a facility during a specified period of time, normally a busy hour, measured in traffic units and defined as the ratio of the time during which a facility is occupied to the time this facility is available for occupancy.

Ans: i

Characteristics of Queuing Theory:

Customer: refers to anything that arrives at a facility and requires. e.g. People, machines, trucks, emails.

Server: refers to any resource that provides the requested service, eg. repair persons, retrieval machines, runways at airport.

Question :2

Answer

Date

Q:2

Ans: a

$$E(X) = \sum_{x=0}^{n} x \binom{n}{x} p^x (1-p)^{n-x}$$

$$= \sum_{x=0}^{n} x \frac{n!}{x!\,(n-x)} p^x (1-p)^{n-x}$$

$$= \sum_{x=1}^{n} \frac{n!}{(x-1)!\,(n-x)!} p^x (1-p)^{n-x}$$

Since the $x=0$ term varishes.

$$E(x) = \sum_{y=0}^{m} \frac{(m+1)!}{y!\,(m-y)!} p^{y+1} (1-p)^{m-y}$$

$$= (m+1)p \sum_{y=0}^{m} \frac{m!}{y!\,(m-y)} p^{y} (1-p)^{m-y}$$

$$= np \sum_{y=0}^{m} \frac{m!}{y!\,(m-y)!} p^{y} (1-p)^{m-y}$$

The binomial theorem sys that

$$(a+b)^m = \sum_{y=0}^{m} \frac{m!}{y!\,(m-y)!} a^y b^{m-y}$$

setting $a=p$ and $b=1-p$

$$\sum_{y=0}^{m} \frac{m!}{y!\,(m-y)!} p^y (1-p)^{m-y} = \sum_{y=0}^{m} \frac{m!}{y!\,(m-y)!}$$

$$a^y b^{m-y} = (a+b)^m = (p+1-p)^m = 1$$

So that

$$\boxed{E(X) = np}$$

Similarly, but this time using;
$y = x-2$ and $m = n-2$

$$E(X(X-1)) = \sum_{x=0}^{n} x(x-1)\binom{n}{x} p^x (1-p)^{n-x}$$

$$= \sum_{x=0}^{n} x(x-1) \frac{n!}{x!\,(n-x)!} p^x (1-p)^{n-x}$$

$$= \sum_{x=2}^{n} \frac{n!}{(x-2)!\,(n-x)!} p^x (1-p)^{n-x}$$

$$= n(n-1)p^2 \sum_{x=2}^{n} \frac{(x-2)!}{(x-2)(n-x)!} p^{x-2}$$
$$(1-p)^{n-x}$$

$$= n(n-1)\,p^2 \sum_{y=0}^{m} \frac{m!}{y!\,(m-y)!} p^y (1-p)^{m-y}$$

$= n(n-1)p^2 (p+(1-p))^m$

$= n(n-1)p^2$

so the variance of x is

$E(x^2) - E(x)^2 = (E(x(x-1)) + E(x) - E(x)^2$

$= n(n-1)p^2 + np - (np)^2$

$\boxed{= np(1-p)}$

b)

Let x denote number of cars which are hired out per day.

For Poisson distribution mean $= m = 1.5$

$$P(X=x) = \frac{e^{-m} \cdot m^x}{x!} = \frac{e^{-1.5} \cdot 1.5^x}{x!}$$

1) P(neither car is used)

$$P(X=0) = \frac{e^{-1.5} \cdot 1.5^0}{0.2231}$$

2) P(some demand is refused) = P(Demad is more than 2 cars per days)

$$P(X>2)$$

$$= 1 - P(X \leq 2)$$

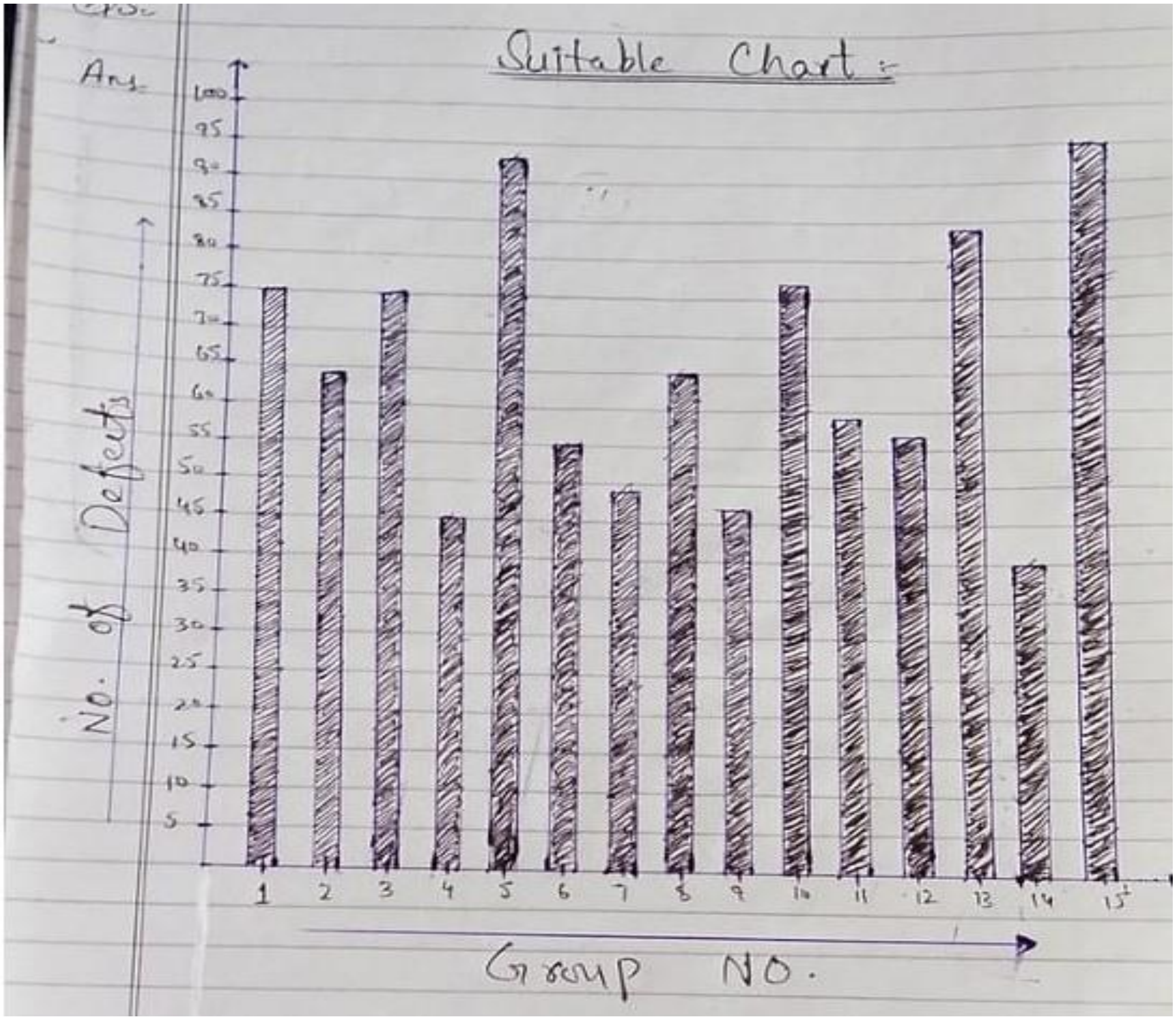
$$= 1 - [P(X=0) + P(X=1) + P(X=2)]$$

$$= 1 - \left[\frac{e^{1.5}\, 1.5^{0}}{0!} + \frac{e^{1.5}\, 1.5^{1}}{1!} + \frac{e^{1.5}\, 1.5^{2}}{2!}\right]$$

$$= 1 - e^{1.5}\left[1 + 1.5 + \frac{2.25}{2}\right] = \boxed{0.1912\%}$$

Question :3

Answer



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