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Dept Bs(cs) 4th semester

Assignment sessional Assignment

Subject Probability & statistic

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Q1 =

Ans = Solution

we know that

$mean = np$

$4 = np$

$p = \frac{4}{n}$ — (1)

Also we know that

$variance = np(1-p)$.

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

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

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

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

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

$-5n = 16$

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

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put in equ — (1)

$$P = \frac{4}{-16/5} = \frac{-20}{16}$$

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

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

Ans (b) :- Critical Region :-
5

The set of outcomes a statistical Test for which the null hypothesis is to be rejected is called critical region.

Ans (c) Properties of t- distribution :-
5

* Like standard normal distribution the shape of t- distribution is also bell shaped and symmetrical with mean zero.

The variance is always greater than one and can be defined only when the degree of freedom $v \geq 3$ and is given as.

$$var(t) = \frac{v}{v-2}$$

The t-distribution has greater variably than the standard normal distribution.

Ans (d) — Analysis of Variance —
5

Analysis of variance (ANOVA) is an anlysis tool used in statistic that splits an observed aggregate varibility found inside a data set into two parts sysmatic factors.

The sysmatic factors have a statistic influence on the given data set while the random factor do not Analysis use the random factor don't Analysis use the ANOVA that independent variables have an regission study.

Ans (e) — R.B.D — It is Randamized
5
Block Design.

In a randamized block design there is only one primary factor under consideration in the experiment. Similar test subject are grouped into blocks.

Each blocks is tested against all treatment levels of the primary factor at random order.

Ans (f) — Statistical Quality Control —
5
Statistically quality control refer to the use of statistical methods in the monitoring and maintainig of the

quality of product and service scale uses different tools to analyze quality problem.

1) Descriptive statistics

2) statistic process control

3) Acceptance sampling

Ans 5 (a) ω chance cause ω

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 causes ω

Assignable cause is an identification specific cause of variation in a given process or measurement. A cause of variation that is not random and does not occur by chance is assignable.

Ans (h) Traffic Intensity
5

It is defined as " The ratio of the time during which a facility is cumulating occupied to the time this facility is available for occupying.

The Traffic intensity

$$\frac{\alpha}{R}$$

Ans (i) characteristic of Queuing Theory
5

From the set of customers waiting for service do we choose the one to be served next (e.g) FIFO (First-in-first out) also known as FCFS (First-come first served) LIFO (Last-in-first-out)

Do we have

Balking (customer deciding not to join the queue if it is too long).

Ronging customer cause the queue of they have waited too long for service.

Q2. 5 :

Ans 5 : The probability function for a binomial random variable is

$$b(x; n, p) = \binom{n}{x} p^x (1-p)^{n-x}$$

if x is random variable with this probability distribution

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

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

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

let $y = x-1$ and $m = n-1$

$x = y+1$ and $n = m+1$

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

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

Binomial Theorm says 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 Proof

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

Similarly but This time and m = n-2

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

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

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

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

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

$$= n(n-1)p^{1}(p+(1-p))^{m}$$

$$= n(n-1)p^{2}.$$

The variance of α is

$$E(\alpha^2) - E(\alpha)^2 = E(\alpha)(\alpha-1) + E(\alpha)$$

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

$$= \cancel{(np)^2} - np^2 + np - \cancel{(np)^2}$$

$$np - np^2$$

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

Ans 5 (b) a) Let α denote number of cars hired out per day Poisson distribution mean $= \mu = 1.5$

$$P(\alpha=2) = \frac{e^{-\mu}\mu^2}{2!} = \frac{e^{-1.5}(1.5)^2}{2!}$$

i) P(neither car is used)

$$P(\alpha=0) = \frac{e^{-1.5}(1.5)^0}{0!} = \boxed{e^{-1.5}}$$

$$P(\alpha=0) = 0.2231$$

Proportion of day on which neither car is used

$0.2231 = \boxed{22.31\%}$

P(some demand is refused)

P(Demand is more than 2 car per days)

$$P(z>2) = 1-P(z\le 2)$$

$$= 1-\{P(z=0)+P(z=1)+P(z=2)\}$$

$$= 1-[(e^{-1.5})(1.5)^0/0!) + (e^{-1.5})(1.5^1/1!) + (e^{-1.5}(1.5)^2/2!)]$$

$$= 1-e^{-1.5}(1+1.5+(2.25/2)\}$$

$$= 1-e^{-1.5}(1+1.5+1.125]$$

$$= 1-e^{-1.5}(3.625)$$

$$= 1-0.8087$$

$$= \cancel{0.912} \quad \boxed{0.1912}$$

Proportion of day on which some demand refuse $= \boxed{19.12\%}$

Ans.

Suitable Chart :-