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Q NO#1

a)

As we know

Mean$(np)=4$

I) varience $(npq)=3$

II) Dividing the LHS & RHS of evuation

II) By evuation (I) we have $npq/np = 3/4$

$\Rightarrow q = 3/4$

Therefore we have $p = 1 - q = 1 - 3/4 = 1/4$

putting the value of $p = 1/4$ in evuation (I)

We have $n = 16$

(B)

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

(C)

The t distribution has the following properties

* The mean of the distribution is ervual to 0.
* The varience is evual to $v/(v-2)$ where v is the degree of freedom (See last Section) & $v>2$
* The varience is always greater than 1, although its close to 1 when there are many degrees of freedom.

(D)

Analysis of varience: or ANOVA is a Statistical method that Separtes observed varience data into different components to use for additional test. A one-way ANOVA is used for three one or more groups of data to gain information about the relationship between the dependent & independent variables.

(E)

RBD: A diagram that gives the relationship between Component States & the Success or of a Specified System function. The logical layout in RBD can be as Series System parallel or a Combination

(F)

Statistical quality control: the use of of Statistical method in the monitoring & maintining of the quality of products

& Services one method reffered 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.

(g)

* Chance Cause:
a process that is operating with only chance causes of variation present is said to be in statistical control.

* Assignable cause:
is a type of variation in which a specific activity or event can be clinked to inconsistency in a system.

(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 (erlangs) & defined as the ratio of the time during which a facility is occupied (continously or cumlatively) to the time this facility is avaiable for occupancy.

(I)

A queuing System is specified completely by the following five basic characteristics the input process. It expresses the mode of arrival the customer at the service facility governed by some probablity law. The number of customers emanate from finite or infinite sources.

Q No # 2

(A)

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

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

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

Since then $x=0$ term variables. let $y = x-1$ & $m = n-1$ Subbing $x = y+1$ & $n = m+1$ into the last sum (& using the fact that the limits $x = 1$ & $x = n$ correspond to $y=0$ & $y = n-1 = m$, respectively)

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

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

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

The binomial theorem say that

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

Setting $a = p$ & $b = 1-p$

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

So that

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

Similarly but this time using $y = x-2$ & $m = n-2$

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

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

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

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

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

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

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

So the varience of x is

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

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

part (b)

let x denote numbers of cars hired out per day

poission distribution mean = m = 1.5

p.(x = x) = (((e^-m)(m^x))/(x!)) = (((e^-1.5)(1.5^x))/(x!))

1) p.(neither car is used).

p(x=0) = (e^-1.5)(1.5^0)/ 0.2231

2) p.(Some demand is refused) = p.(Demands is more than 2 cars per day)

$= P(x>2)$

$= 1 - P(x \le 2)$

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

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

$= 1 - e^{\wedge}1.5[1 + 1.5 + (2.25/2)] = 0.1912$ proportion of days on which neither car is used

$= 0.2231 = 22.31\%$

proportion of days on which some demands is refused $= 0.1912 = 19.12\%$

QNO#3