NAME : AQIB

ID : 15415

Subject : Probality and stat

Degrree : BSC

Q1

a)

As we know

Mean (np) = 4 ... (i) Variance (npq) = 3 ... (ii)

Dividing the LHS and RHS of equation (ii) by equation (i) we have

Npq/np = 3/4

=> q = 3/4

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

Putting the value of p = 1/4 in equation (i),

We have n = 16.

C)

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

d)

The **t distribution** has the following **properties**:

The mean of the **distribution** is equal to 0.

The variance is equal to v / (v - 2), where v is the degrees of freedom (see last sectio and v > 2.

The variance is always greater than 1, although it is close to 1 when there are many degrees of freedom.

E)

Analysis of variance, or ANOVA, is a statistical method that separates observed **variance** data into different components to use for additional tests. A one-way AN is used for three or more groups of data, to gain information about the relationship between dependent and independent variables

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f)

RBD: A diagram that gives the relationship between component states and the success or failure of a specified system function. The logical layout in an **RBD** can be as ser system, parallel system, or a combination.

g)

Statistical quality control, the use of **statistical** methods in the monitoring and maintaining the **quality** of products and services. One method, referred to as acceptance sampling, can b 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

h)

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

Assignable cause is a type of variation in which a specific activity or event can be linke inconsistency in a system..

I)

traffic intensity: A measure of the average occupancy of a facility during a specified period o time, normally a busy hour, measured in **traffic** units (erlangs) and defined as the ratio of the time during which a facility is occupied (continuously or cumulatively) to the time this facility available for occupancy

Q2

Part 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 vanishes. Let $y = x-1$ and $m = n-1$. Subbing $x = y+1$ and $n = m$ into the last sum (and using the fact that the limits $x = 1$ and $x = n$ correspond to $y =$ and $y = n-1 = m$, 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 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 that

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

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

$$\begin{aligned}
E(X(X-1)) &= \sum_{x=0}^{n} x(x-1)\binom{n}{x} p^x (1-p)^{n-x} \\
&= \sum_{x=0}^{n} x(x-1)\frac{n!}{x!(n-x)!} p^x (1-p)^{n-x} \\
&= \sum_{x=2}^{n} \frac{n!}{(x-2)!(n-x)!} p^x (1-p)^{n-x} \\
&= n(n-1)p^2 \sum_{x=2}^{n} \frac{(n-2)!}{(x-2)!(n-x)!} p^{x-2} (1-p)^{n-x} \\
&= n(n-1)p^2 \sum_{y=0}^{m} \frac{m!}{y!(m-y)!} p^y (1-p)^{m-y} \\
&= n(n-1)p^2 (p + (1-p))^m \\
&= n(n-1)p^2
\end{aligned}$$

So the variance of X is

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

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

Part b)

Let X denote number of cars hired out per day
Poisson 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 (Demand is more than 2 cars per day
P(x>2)
=1−P(x≤2)
=1−[P(x=0)+P(x=1)+P(x=2)]

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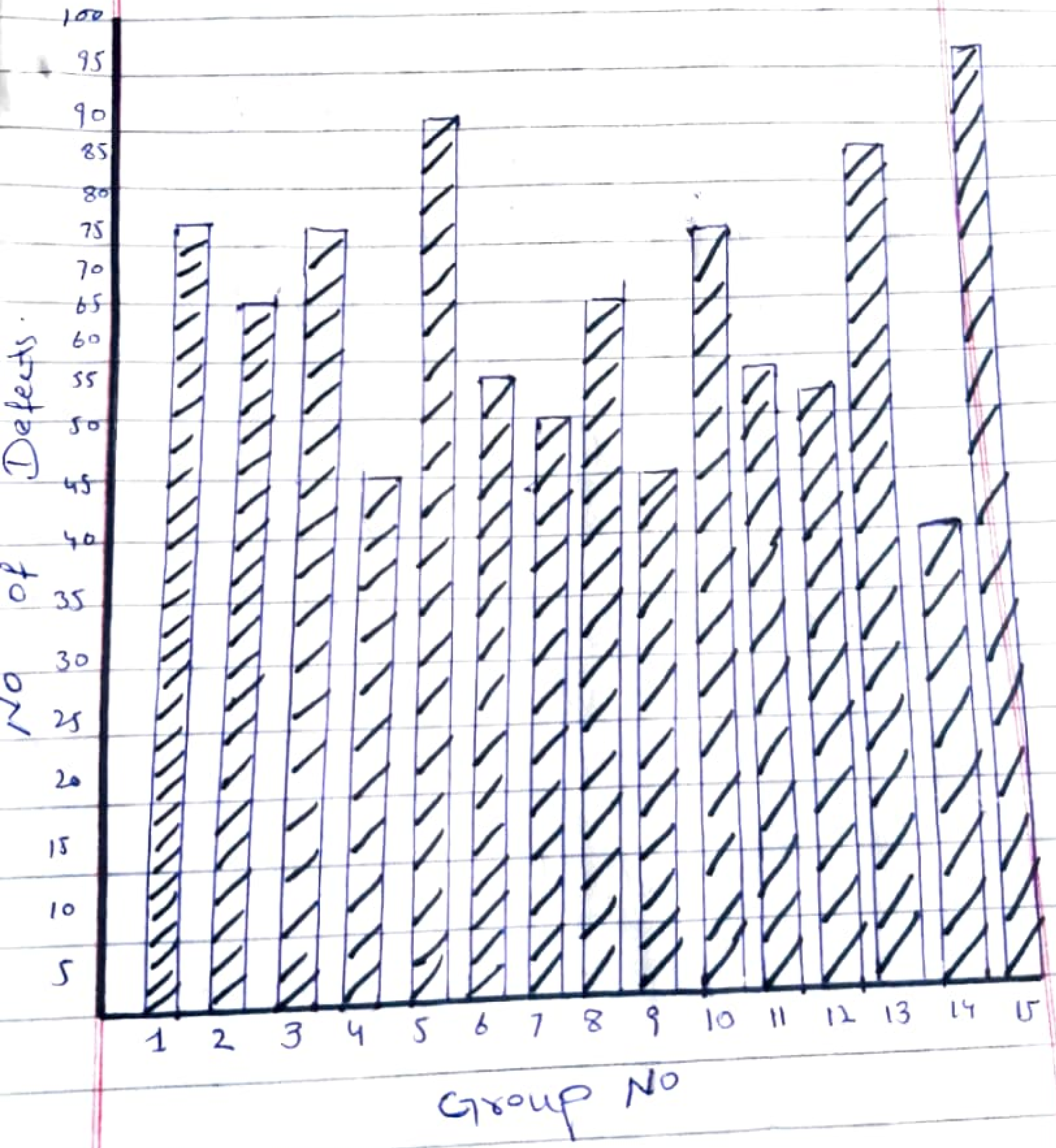
=1−[((e^−1.5)(1.5^0)/0!)+((e^−1.5) (1.5^1)/1!)+((e^1.5) (1.5^2)/2!)]

$=1-[((e^1.5)(1.5^0)/0!)+ ((e^1.5) (1.5^1)/1!)+ ((e^1.5) (1.5^2)/2!)]$
$=1-e^1.5[1+1.5+ (2.25/2)]=0.1912$Proportion of days on which ne
is used = 0.2231 = 22.31 %
Proportion of days on which some demand is refused = 0.1912 =


No of Defects
100
95
90
85
80
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Group No