CAT-2 QUESTION BANK - 2M:

UNIT-3.

1. State any two properties of T-Distribution.

* The range of T-Distribution is from $-\infty$ to ∞

* T-Distribution is symmetrical about $t=0$ and has a mean $=0$.

* Variance of T-distribution $\frac{\nu}{\nu-2}$ is $\nu>2$.

2. State the condition under which chi-square(χ^2) test of Goodness of fit is vaild:

* The sample observations should be independent.

* Constraints on cell frequencies, if any, must be linear [$\sum f_i = \sum O_i = \sum E_i$].

* N, the total frequency should be atleast 50.

* No theoretical cell frequency should be less than 5.

3. What are the expected frequencies of 2×2 contingency table.

Consider 2×2 contingency Table.

A	a	b
B	c	d

→

a	b	a+b
c	d	c+d
a+c	b+d	N = (a+b)+(c+d)

Expected Frequencies = $\frac{\text{corresponding Row total} \times \text{column total}}{\text{Grand total}}$.

DEGREE OF FREEDOM:

$\nu = (r-1)(s-1)$.

4. Write the application of 'F' Test:

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* Whether the independent sample have been draw from the normal population with the same variance (σ^2).

* Whether the two independent estimates of population variances are Homogeneous or not.

5. Write the application of χ^2 test:

* To test the Goodness of fit.

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* To test the independence of attributes.

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UNIT-4

1. State the basic principles of experimental design?

There are three principles of experimental design, they are

*. Randomization

*. Replication

*. Local controls

2. Define ANOVA

ANOVA stands for Analysis of variance. It is an arithmetical procedure, used to express the total variation of data as the sum of its non-negative components

3. what are the basic assumptions in analysis of variance.

*. The observation are independent

*. Parent population from which observations are taken in normal population.

4. write down the ANOVA table for Two-way classification.

Source of variation	Sum of Squares	DOF	Mean Squares	Variance Ratio	Table value
Between Column	SSC	$c-1$	$MSC = \frac{SSC}{c-1}$	$F_C = \frac{MSC}{MSE}$ (or) $F_C = \frac{MSE}{MSC}$	
Between rows	SSR	$r-1$	$MSR = \frac{SSR}{r-1}$	$F_R = \frac{MSR}{MSE}$ (or) $F_R = \frac{MSE}{MSR}$	
Error	SSE	$(c-1)\times(r-1)$	$MSE = \frac{SSE}{(c-1)\times(r-1)}$		

5. Write down the ANOVA table for one-way classification

Source of Variation	Sum of Squares	degrees of freedom	Mean Square	Variance Ratio	Table Value
Between Column	SSC	C-1	$MSC = \frac{SSC}{C-1}$	$F_C = \frac{MSE}{MSC}$ (or) $F_C = \frac{MSC}{MSE}$	
Error	SSE	N-C	$MSE = \frac{SSE}{N-C}$		
Total	TSS				

6. Compare and Contrast Latin Square design and Randomized block design

*. In LSD, the number of treatments is equal to the number of replicants whereas there is no such restrictions on treatments and replications in RBD

*. LSD is known to be suitable for a case when the number of treatments is between 5 and 12 since the square becomes large and does not remain homogenous, whereas RBD can be used for any number of treatments

*. In the field layout, LSD can be performed on a square field while RBD can be performed either on a square or rectangular field

7. Why a 2x2 latin square design is not possible? Explain

In latin square, the formula for degrees of freedom for residual is $d.f = (n-1)(n-2)$ Substituting $n=2$, $d.f = 0$, MSE 2x2 Latin square is not possible

8. What are the advantages of the latin square design over other designs.

*. latin square design controls variability in two directions of the experimental material

*. The analysis of the design is simple and straight forward and is a three way classification of analysis of variance.

9. write down the ANOVA table for latin square design.

Source of variation	Sum of Squares	Degrees of freedom	Mean squares	variance ratio	Table value
Between Column	SSC	$k-1$	$MSC = \frac{SSC}{k-1}$	$F_C = \frac{MSC}{MSE}$	
Between rows	SSR	$k-1$	$MSR = \frac{SSR}{k-1}$	$F_R = \frac{MSR}{MSE}$	
Between Treatments	SSK	$k-1$	$MSK = \frac{SSK}{k-1}$	$F_T = \frac{MSK}{MSE}$	
Error	SSE	$(k-1)(k-2)$	$MSE = \frac{SSE}{(k-1)(k-2)}$		

10. what are the uses of analysis of variance.

*. Test the homogenity of several means

*. The ANOVA technique is now frequently applied in testing the linearity

Unit - 5

1 Distinguish between chance variation and assignable variation.

Chance Variation	Assignable Variation
It Consists of many individual causes.	This Consists one or just a few individual causes
It Results in small amount of variation	It Result in large amount of variation.
Elimination of chance causes is not feasible.	Elimination is feasible and should be done.
Eg : Variations in Temperature	Eg : Defective raw materials

2 Define process and product control.

Process control:

This means the control of the process of Goods while they're in the process of production.

Product control:

Here the quality of the product is controlled when the product is ready to dispatch or to sell to the customer.

3 Explain briefly the types of control charts for attributes.

i) c-chart

ii) p-chart

iii) np-chart

4 What is control chart?

A control chart is designed to display successive measurements of a process with a center line be control limit.

5 What is meant by statistical quality control?

Statistical Quality control is a statistical method for finding whether the variation in the quality of the product is due to random causes or assignable causes.

6 Distinguish between Defects and Defectives.

Defect	Defectives
A flaw or single quality characteristic that does not meet customer's requirement or specification.	A unit of product that does not meet customer's requirement or specification.
Also known as non-conformity.	Also known as non-conforming unit.
Ex: A stain on a cover that fails customer's specification is a defect.	Ex: A disc clamp that does not meet the parallelism specification is a defective.

Discuss the Merits and Demerits of p-Chart.

Merits of p-Chart:

* Data readily available.
* Helps prioritize problem areas.
* Easy to create with fixed and variable Subgroup Size.

Demerits of p-Chart:

* Counts failures - not prevention
* Cannot isolate causes of process problem.
* Limits hard to construct on variable subgroup size.

8 Define producer's risk and Consumer's risk.

Producer's risk:

It is the risk of reflecting the lot of good quality product based on the sample having bad quality.

Consumer's risk:

It is the risk of accepting the lot of bad quality products based on the sample having good quality.

9 Mention any two uses of Statistical quality control.

* To collect and analyse relevant data for the purpose of detecting whether the process is under control or not.

* The value of quality control lies in the fact that assignable causes in a process can be quickly detected.

10 Mention any two practical situation where C-chart is needed

1) No. of defects observed in a bale of cloth
2) No. of defects in the sheet of photographic film
3) No. of defects in a painted surface of a given area.

9. mention any two uses of statistical quality control?

1). SQC is used to access the cause of variation in the quality of the manufacture products

2). It is used to make the necessary corrections so that no defective products are produced and process control is achieved