Date
24th June, 2020

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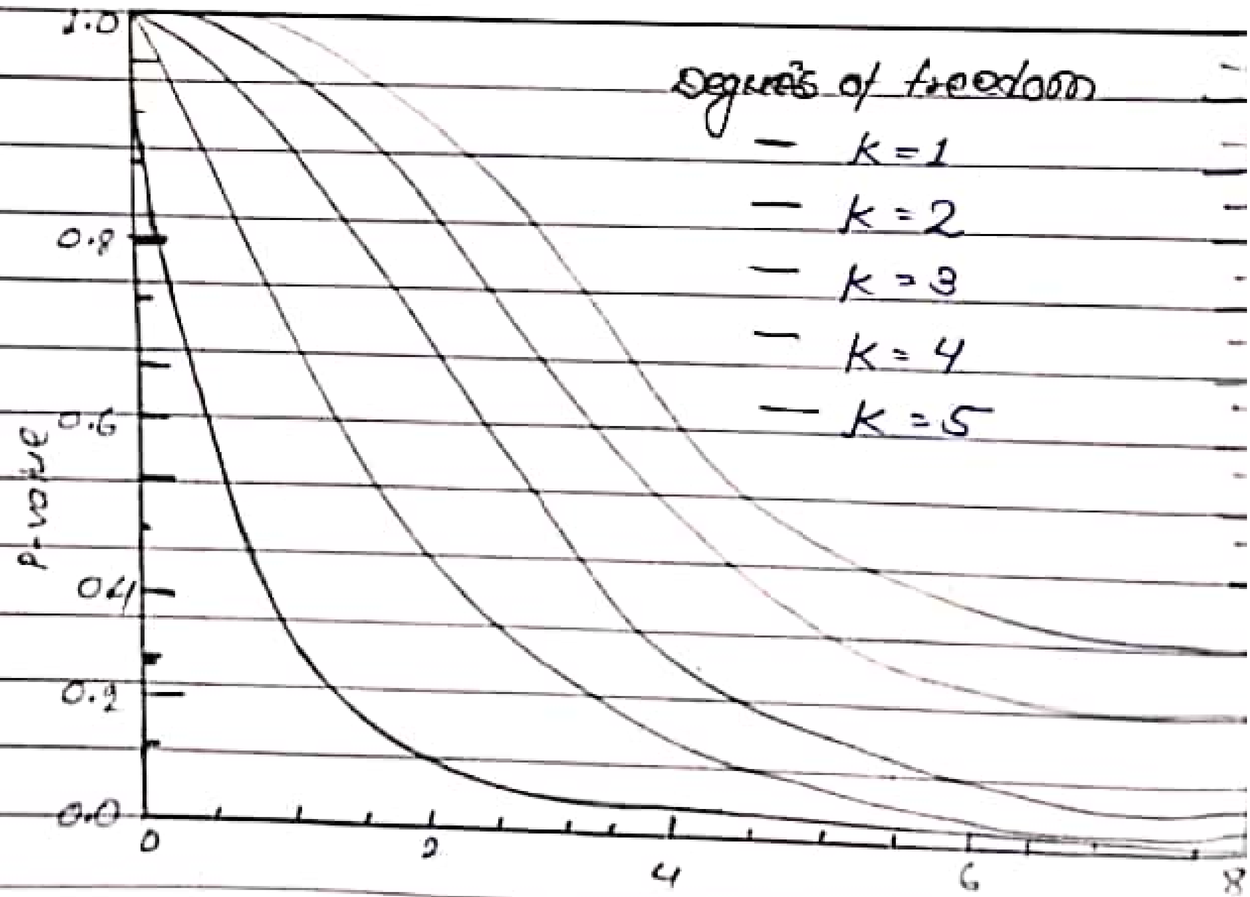
Notes for B.Sc part 1st, paper 2(A).

Question :- Write Notes on CHI SQUARE TEST.

Answer :- CHI- squared test :-



x^2 = Pearson's cumulative test statistic

Date 24-6-2020

A chi-square test, also written as χ^2 test, is a statistical hypothesis test that is valid to perform when the text statistically Pearson's chi-square test and variants thereof. Pearson is chi-square test is used to determine whether there is a statistically significant difference between the expected frequencies and the observed frequencies in one or more categories of a contingency table.

chi-square tests often refers to tests for which the distrib-ution of the test statistic approaches the χ^2 distribution asymptotically, meaning that the sampling distribution (if the null hypothesis is true) of the test statistic approximates a χ^2 distribution more and more closely as sample sizes increase.

Date
24.6-2020

Other examples of χ^2 tests:-

One test statistic that follows a chi-square distribution exactly is the test that the variance of a normally distributed population has a given value based on a sample variance. such tests are uncommon in practice because the true variance of the population is usually unknown. However, there are several statistical tests where the chi-square distribution is approximately valid:

~~Fishers~~ Fisher's exact test:-

For an exact test used in place of the 2×2 χ^2 test for independence, see Fisher's exact test.

Binomial test :-

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For an exact test used in place of the $2 \times 1 \chi^2$ test for goodness of fit, see Binomial test.

Example χ^2 test for categorical data :-

Suppose there is a city of 1,000,000 residents with four neighbourhoods : A, B, C, and D. A random sample of 650 residents of the city is taken and their occupation is recorded as "white collar", "blue collar", or "no collar". The null hypothesis is that each person's neighbourhood of residence is independent of the person's occupational classification. The data are tabulated as:

	A	B	C	D	total
White collar	90	60	104	95	349
Blue collar	30	50	51	20	151
No collar	30	40	45	35	150
	150	150	200	150	650

let us take the sample living in neighborhood A, 150, to estimate what porporation of the whole 1,000,000 live in neighbourhood A. Similarly, we take 349/650 to estimate what proportion of the 1,000,000 are white - collar workers. By the assumption of independence under the hypothesis, we should "expect" the number of white collar workers in neighborhood A to be

$$150 \times 349/650 \approx 80.54$$

Then in that " cell" of the table, we have

$$(\text{observed} - \text{expected})^2 / \text{expected}$$

$$= (90 - 80.54)^2 / 80.54$$

$$\approx 1.1$$

Date 24.06.2020

In bioinformatics, the x^2 test is used to compare the distribution of certain properties of genes (e.g., genomic content, mutation rate, interaction network clustering, etc.) belonging to different categories (e.g., disease genes, essential genes, genes on a certain chromosome etc.)

see also :-

- contingency table
- chi-square test nomogram
- G-test
- Minimum chi-square estimation
- Nonparametric statistics
- Wald test
- Wilson score interval

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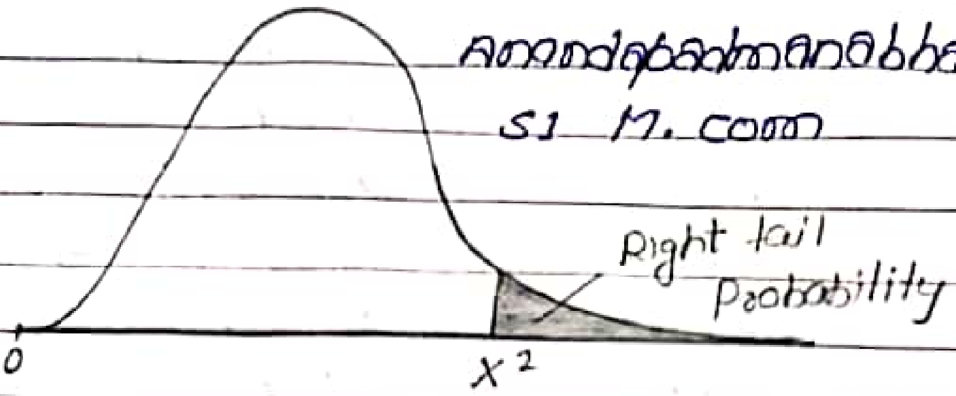

Chi-square test

Other x^2 tests :-

- Cochran-Mantel-Haenszel chi-square test.
- McNemar's test, used in certain 2x2 tables with pairing
- Tukey's test of additivity
- The portmanteau test in time-series analysis, testing for the presence of autocorrelation