SNS COLLEGE OF TECHNOLOGY, COIMBATORE – 641035
(An Autonomous Institution)
MA 201 – STATISTICS AND NUMERICAL METHODS

One mark, Two mark and Model Questions

PART –A

One Mark Questions and Answers

1 The meaning of α is

a. Probability of rejecting the null hypothesis given its true

b. Probability of Type I error

c. Significant level

d. All of the above

2 The meaning of β is

a. The probability of type II error b. Significance level

c. Probability of rejecting a null hypothesis when its true d. All of the above

3 A clinical trial was designed to test the efficiency of a medicine to reduce the systolic blood pressure. A group of 20 hypertensive patients were randomly selected and their blood pressure was recorded. The medicine was administered and a second reading was recorded from the same group of patients. The convenient test of significance to be conducted is

a. One proportion Z-test **b. Paired t-test** c. Independent t-test for two means

d. Two proportion z-test

4 A statement about a population developed for the purpose of testing is called

(a) Hypothesis (b) Hypothesis testing (c) Level of significance (d) Test-statistic

5 Any hypothesis which is tested for the purpose of rejection under the assumption that it is true is called

(a) Null hypothesis (b) Alternative hypothesis (c) Statistical hypothesis (d) Composite hypothesis

6 A statement that is accepted if the sample data provide sufficient evidence that the null hypothesis is false is called

(a) Simple hypothesis (b) Composite hypothesis (c) Statistical hypothesis **(d) Alternative hypothesis**

7 The probability of rejecting the null hypothesis when it is true is called

(a) Level of confidence **(b) Level of significance** (c) Power of the test (d) Difficult to tell

8 The dividing point between the region where the null hypothesis is rejected and the region where it is not rejected is said to be

(a) Critical region **(b) Critical value** (c) Acceptance region (d) Significant region

9 If the critical region is located equally in both sides of the sampling distribution of test-statistic, the test is called

(a) One tailed **(b) Two tailed** (c) Right tailed (d) Left tailed

10 The choice of one-tailed test and two-tailed test depends upon

(a) Null hypothesis **(b) Alternative hypothesis** (c) None of these (d) Composite hypotheses

11 Test of hypothesis Ho: $\mu = 50$ against H1: $\mu > 50$ leads to

(a) Left-tailed test **(b) Right-tailed test** (c) Two-tailed test (d) Difficult to tell

12 Test of hypothesis Ho: $\mu = 20$ against H1: $\mu < 20$ leads to

(a) Right one-sided test **(b) Left one-sided test** (c) Two-sided test (d) All of the above

13 Testing Ho: $\mu = 25$ against H1: $\mu \neq 20$ leads to

(a) Two-tailed test (b) Left-tailed test (c) Right-tailed test (d) Neither (a), (b) and (c)

14 A rule or formula that provides a basis for testing a null hypothesis is called

(a) Test-statistic (b) Population statistic (c) Both of these (d) None of the above

15 The range of test statistic-Z is

(a) 0 to 1 (b) -1 to +1 (c) 0 to ∞ **(d) $-\infty$ to $+\infty$**

16 The range of test statistic-t is

(a) 0 to ∞ (b) 0 to 1 **(c) $-\infty$ to $+\infty$** (d) -1 to +1

17 If Ho is true and we reject it is called

(a) Type-I error (b) Type-II error (c) Standard error (d) Sampling error

18 The probability associated with committing type-I error is

(a) β **(b) α** (c) $1 - \beta$ (d) $1 - \alpha$

19 A failing student is passed by an examiner, it is an example of

(a) Type-I error **(b) Type-II error** (c) Unbiased decision (d) Difficult to tell

20 A passing student is failed by an examiner, it is an example of

(a) Type-I error (b) Type-II error (c) Best decision (d) All of the above

21 $1 - \alpha$ is the probability associated with

(a) Type-I error (b) Type-II error **(c) Level of confidence** (d) Level of significance

22 Area of the rejection region depends on

(a) Size of α (b) Size of β (c) Test-statistic (d) Number of values

23 Student's t-test is applicable only when

(a) $n \leq 30$ (b) $n > 30$ (c) $n = 30$ and σ is known (d) All of the above

24 Student's t-statistic is applicable in case of

(a) Equal number of samples (b) Unequal number of samples (c) Small samples **(d) All of the above**

25 The degree of freedom for paired t-test based on n pairs of observations is

(a) 2n - 1 (b) n - 2 (c) 2(n - 1) **(d) n - 1**

26 Statistic-t is defined as deviation of sample mean from population mean μ expressed in terms of

(a) Standard deviation **(b) Standard error** (c) Coefficient of standard deviation (d) Coefficient of variation

27 Student's t-distribution has (n-1) d.f. when all the n observations in the sample are

(a) Dependent **(b) Independent** (c) Maximum (d) Minimum

28 Suppose that the null hypothesis is true and it is rejected, is known as

(a) A type-I error, and its probability is β

(b) A type-I error, and its probability is α

(c) A type-II error, and its probability is α

(d) A type-Il error, and its probability is β

29 An advertising agency wants to test the hypothesis that the proportion of adults in Pakistan who read a Sunday Magazine is 25 percent. The null hypothesis is that the proportion reading the Sunday Magazine is

(a) Different from 25% **(b) Equal to 25%** (c) Less than 25 % (d) More than 25 %

30 When we carry out a chi-square test for independence, the null hypothesis states that the two relevant classifications

(a) are mutually exclusive

(b) form a contingency table with r rows and c columns.

(c) have (r –1) and (c –1) degrees of freedom where r and c are the number of rows and columns, respectively.**(d) are statistically independent.**

31 The test statistic for the goodness of fit test for multinomial probabilities has the following degrees for freedom

(a) k – 1 **(b)** k – 3 **(c) (r –1)(c – 1)** (d) k – 1 – m

32 A chi-square goodness of fit test is considered to be valid if each of the expected cell frequencies is

(a) greater than 0. (b) less than 5. (c) between 0 and 5 (d) **at least 5**

33 In a χ^2 test for independence, the statistic based on a contingency table with 6 rows and 5 columns will have ____ degrees of freedom.

(a) 30 (b) 24 (c) 5 (d) **20**

34 If a teacher is trying to prove that new method of teaching math is more effective than traditional one, he/she will conduct a

(a) one-tailed test (b**)** two-tailed test (c) point estimate of the population parameter

(d) confidence interval

35 The alternative hypothesis is also known as the

(a) elective hypothesis (b) optional hypothesis (c) **research hypothesis (d)** null hypothesis

PART –B

Two Mark Questions and Answers

1 Define standard error.

The S.D of sampling distribution of a statistic is known as its standard error.

2 What is Type I and Type II error?

i) Type I error : Reject H_0 when it is true.

ii) Type I error : Accept H_0 when it is wrong.

3 Write the application of 'F'-test .

1. To test if the 2 samples have come from the same population

2.To test whether there is any significant difference between two estimates of population variance.

4 Write two applications of ψ^2 test.

1. ψ^2 is used to test whether differences between observed and expected frequencies are significances.

2. To test the goodness of fit.

3. to test the independent of attributes.

5 Define critical region.

A region corresponding to a statistic t in the sample space S which lead to the rejection of H_0 is called critical region or rejection region. Those region which lead to the acceptance of H_0 give us a region called Acceptance region.

6 Define Level of significance.

The probability 'α' that a random value of the statistics't' belongs to the critical region is known evel of significance. In otherwords, level of significance is the size of the Type I error.

7 Define Null hypothesis

The test of significance, we first set up of a hypothesis a definite statement about the population parameter, such a hypothesis is usually a hypothesis of no difference and it is denoted by H_0.

8 What do you mean by One tailed and two tailed tests?

When the hypothesis about the population parameter is rejected only for the value of sample statistic falling into one of the tails of the sampling distribution is known as one tailed test.

Two tailed test is one where the hypothesis about the population parameter is rejected for the values of the sample statistic falling into the either tails of the sampling distribution.

9 What do you mean by Degrees of freedom?

The number of degrees of freedom is the total number of observations minus the number of independent constraints imposed on the observations.

10 What are parameters and statistics in sampling?

The statistical constants of the populations are called parameters. The statistical constant of the samples are called statistic. For example

Constants	Population	Sample
Mean	M	$\bar{x}$
SD	Σ	s

11 Mention the various steps involved in testing of hypothesis.

1. Null Hypothesis is defined. 2. Alternative Hypothesis defined. 3. LOS fixed. 4. Apply the test statistic. 5. write the conclusion whether H_0 is accepted or not.

12 Define Chi-Square test for goodness of fit

Chi Square test of goodness of fit is a test to find if the deviation of the experiment from theory is just by chance or it is due to the inadequacy of the theory to fit the observed data. By his test, we test whether differences between observed and expected frequencies are significant or not.

13 Write the formula for the Chi-square test of goodness of fit of a random sample to a hypothetical distribution.

$\chi^2 = \sum \frac{(O-E)^2}{E}$, where O is the observed value and E is the expected value.

14 What are the applications of t test?

(i) Test of Hypothesis about the population mean.

(ii) Test of Hypothesis about the difference between two means.

(iii) Test of Hypothesis about the difference between two means with dependent samples.

(iv) Test of Hypothesis about the observed sample correlation coefficient and sample regression coefficient.

15 Write down any two properties of chi – Square distribution.

(i) The mean and variance of the chi – Square distribution are n and 2n respectively.

(ii) As $n \to \infty$, Chi – Square distribution approaches a normal distribution.

(iii) The sum of independent Chi – Square variates is also a Chi – Square variate.

16 What are the assumptions for Student's 't' test?

(i) The parent population from which the sample drawn is normal.

(ii) The sample observations are independent.

(iii) The population standard deviation σ is unknown.

PART –C Model Questions

1 **A random sample of 10 boys had the following I.Q's 70,120,110,101,88,83,95,98,107,100. Do these data support the assumption of a population mean I.Q's of 100? Find a reasonable range in which most of the mean I.Q's values of sample of 10 boys lie**.

2 **Below are given the gain in weights of pigs fed on two diets A and B**

Diet A	**25**	**32**	**30**	**34**	**24**	**14**	**32**	**24**	**30**	**31**	**35**	**25**	**-**	**-**	**-**
Diet B	**44**	**34**	**22**	**10**	**47**	**31**	**40**	**30**	**32**	**35**	**18**	**21**	**35**	**29**	**22**

Test if the two diets differ significantly as regards their effect on increase in weight.

3 Two random samples gave the following results

Sample	Size	Sample mean	Sum of squares of deviations from the mean
1	10	15	90

2	12	14	108

Test whether the samples come from the same normal population.

4 A cigarette manufacturing firm claims that its brand A line of cigarettes outsells its brand B by 8%. If it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B, test whether the 8% difference is a valid claim.

5 The random samples were drawn from two normal populations and the following results were obtained.

Sample I 16 17 18 19 20 21 22 24 26 27

Sample II 19 22 23 25 26 28 29 30 31 32 35 36

Obtain estimates of the variances of populations and test whether the two populations have the same variances.

6 In one sample of 10 observations from a normal population, the sum of the squares of the deviations of the sample values from the sample mean is 102.4 and in another sample of 12 observations from another normal population, the sum of the squares of the deviations of the sample values from the sample mean is 120.5. Examine whether the two normal populations have the same variances.

7 The number of automobile accidents per week in a certain community are as follows: 12, 8, 20, 2, 14, 10, 15, 6, 9, 4. Are these frequencies in agreement with the belief that accident conditions were the same during this 10 week period.

8 **The following figures show the distribution of digits in numbers chosen at random from a telephone directory.**

Digits	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Frequency	**1026**	**1107**	**997**	**966**	**1075**	**933**	**1107**	**972**	**964**	**853**

Test whether the digits may be taken to occur equally frequently in the directory.

9 **In an experimental on immunization of cattle from tuberculosis the following research were obtained.**

	Affected	**Not affected**
Inoculated	**12**	**26**
Not Inoculated	**16**	**6**

Calculate ψ^2 and discuss the effect of vaccine in controlling susceptibility to tuberculosis.

10 1000 students at college level were graded according to their I.Q. and the economic conditions of their homes. Use ψ^2 - test to find out whether there is any association between economic conditions at home and I.Q.

	Economic conditions		
	High	Low	Total
Rich	460	140	600
Poor	240	160	400
Total	700	300	1000

11 The Mean breaking strength of the cables supplied by a manufacturer is 1800 with an SD of 100. By a new technique in the manufacturing process, it is claimed that the breaking strength of the cable has increased. To test this claim a sample of 50 cables is tested and is found that the mean breaking strength is 1850. Can we support the claim at 1% level of significance.

12 A simple sample of heights of 6400 English men has a mean of 170 cm. and a S.D of 6.4 cm, while a simple sample of heights of 1600 Americans has a mean of 172 cm. and a S.D of 6.3 cm. Do the data indicate that Americans are the average taller than the English men?

13 In a sample of 600 students of a certain college 400 are found to use dot pens. In another college, from a sample of 900 students 450 were found to use dot pens. Test whether the two colleges are significantly different with respect to the habit of using dot pens.

14 Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same, at 5% level.

15 In a sample of 400 parts manufactured by a factory, the number of defective parts was found to be 30. The company, however, claimed that only 5% of their product is defective. Is the claim tenable?

16 40 People were attacked by a disease and only 36 survived. Will you reject the hypothesis that the survival rate, if attacked by this disease, is 85% in favour of the hypothesis that it is more at 5% level of significance.