Test the hypothesis that the treatment effects are equal to zero, showing all the steps in the general test procedure. (Given that $F_{0.05}(3, 12) = 4.49$ and $F_{0.05}(4, 12) = 3.26$.) (6,6)

6/12/18 (Evening)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1048 **I**

Unique Paper Code : 32375301

Name of the Paper : Basics of Statistical Inference

Name of the Course : **Statistics ; G.E. for Honours**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **six** questions in all.
3. Question No. **1** is compulsory.
4. Attempt five questions from the remaining questions.
5. Use of simple calculator is allowed.

1. (a) Answer the following :

(i) If $X_1, X_2, \ldots, X_n$ be a random sample of size n from a population with mean μ and variance σ^2, then $E(\bar{X})$ = _____ and $V(\bar{X})$ = _____ .

(ii) Level of significance is denoted by _____.

(iii) In 5 × 4 contingency table the number of degrees of freedom is _____.

(iv) In any testing problem, if $p \leq ....$, then we reject H_0.

(v) The test statistic, for testing H_0: There is no correlation, is _____.

(vi) In the case of test for single proportion, the SE is _____.

(vii) The total variance comprises variance _____ samples and variance _____ samples.

(viii) When the sum of squares is divided by the degrees of freedom, the result is frequently called _____.

(ix) In a CRD with N plots and v treatments, the d.f. for error is _____.

(b) Outline the merits and demerits of RBD.

(c) Define Type I and Type II error. (9,3,3)

6. For a two-way classified data with one observation per cell :

(a) Give the fixed effect mathematical model stating clearly:

(i) the assumptions used,

(ii) the hypotheses to be tested,

(iii) the test statistics to be used and

(iv) the ANOVA Table.

(b) Also obtain: (i) the estimates of the parameters in the model and (ii) the expectation of the mean square error. (6,6)

7. (a) What are the basic principles of Design of Experiments? Explain each one of them clearly.

(b) Complete the following table for the analysis of variance of a fixed effects randomised block design:

Source of variation	Degrees of freedom	Sum of squares	Mean sum of squares	Variance ratio
Blocks	4	26.8	–	–
Treatments	3	–	–	–
Error	–	–	2.5	
Total	–	85.3		

2. (a) Define unbiasedness and efficiency of an estimator.

(b) Let X_1, X_2, X_3 be independent variables such that each X_i, has mean μ and variance σ^2. If T_1, T_2 and T_3 are the estimators used to estimate μ, where (i) $T_1 = X_1 + X_2 - X_3$ (ii) $T_2 = (X_1 + X_2 + X_3)/3$ (iii) $T_3 = (2X_1 - X_2 + X_3)/2$.

Are T_1, T_2 and T_3 unbiased estimators for μ? Which is the efficient estimator? (3,9)

3. (a) Explain the method of constructing $100(1-\alpha)\%$ confidence interval for μ of normal population with mean μ and variance σ^2. How do you proceed if σ^2 is (i) known and (ii) unknown?

(b) If a random sample of size $n = 16$ from a Normal population with variance $\sigma^2 = 36$ has the mean $\bar{x} = 62.5$, construct 95% confidence interval for the population mean μ. (7,5)

4. (a) Describe Sign test to test the null hypothesis H_0: $\mu = \mu_0$ against the alternative hypothesis H_1: $\mu > \mu_0$. How do you proceed for paired data?

(b) It is desired to test the hypothesis that the median value of a continuous distribution is 15 against the alternative hypothesis $\mu > 15$ for the following data :

17, 18, 16, 19, 14, 21, 19, 13, 17 and 14. Use $\alpha = 0.05$. (6,6)

5. (a) What is Yate's correction? When do you apply it? The following data collected on two characters :

	Cine-goers	Non cine-goers	Total
Literate	83	57	140
Illiterate	45	68	113
Total	128	125	253

Based on this, can you conclude that there is no relation between the habit of cinema going and literacy? (Given that $\chi^2_{0.05,3} = 7.815$, $\chi^2_{0.05,2} = 5.991$, $\chi^2_{0.05,1} = 3.841$.)

(b) Random sample 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 against that they are not, at 1% level of significance. (6,6)