

AB-135

April-2023

B.Sc., Sem.-VI

307 : STATISTICS (Testing of Hypothesis) (New Course)

Time : 2:30 Hours]

[Max. Marks : 70

- Instructions :**
- (1) Figures to the right indicate full marks of the question/sub-question.
 - (2) Notations used in this question paper carry their usual meaning.
 - (3) Use of scientific calculator is allowed.
 - (4) Statistical & Logarithmic tables and graph papers will be provided on request.

1. (i) Elaborate term “Statistical Hypothesis”, giving illustration. 7

In context to Statistical Hypothesis, define terms :

Statistical hypothesis, simple and composite hypothesis, type one error, level of the test.

- (ii) A coin is tossed 6 times. The hypothesis $H_0 : p = 0.5$ is rejected if more than 3 heads appear. Obtain the probability of type I and type II errors and power function of the test for testing $H_0 : p = 0.5$ vs $H_1 : p = 0.55$, (where p indicates the probability of getting a success in any trial). Also, find the power of the test. 7

OR

- (i) State and prove Neyman Pearson Lemma. 7
- (ii) A random sample of size n is taken from $P(\Theta)$. Use Neyman Pearson Lemma to find out most powerful critical region for testing $H_0 : \Theta = \Theta_0$ Vs $H_1 : \Theta = \Theta_1$, (where $\Theta_0 < \Theta_1$). 7

2. (i) Two independent random samples of persons, each of size m and n , respectively were taken to know the preference to nutritional supplements. How do you test the significance of difference between proportions of persons from each sample using the nutritional supplements ? 7
- (ii) A paired random sample of size n was taken from a bivariate normal population resulted in an observed correlation coefficient as r . What is the procedure to test the null hypothesis $H_0 : \rho = 0$? 7

OR

- (i) It is desired to test the hypothesis that $H_0 : \mu = \mu_0$, a sample of LED lamps (20 W) used in Head lights of automobiles, of size $n > 30$ was taken from a particular batch of 1000 LED lamps (20 W) produced at a manufacturing plant, at random. (Where an average life of LED lamps, μ_0 is specified). Describe a test procedure. 7
- (ii) Given two observed correlation coefficients r_1 and r_2 , based on two bivariate random samples, each of sizes n_1 and n_2 , respectively, then discuss a test procedure to test significance of difference between two observed correlation coefficients. 7
3. (i) A survey was conducted on N persons to study whether two attributes – Area of residence : Urban & Rural and level of education : Graduate & Post Graduate, respectively, a 2×2 contingency table was prepared and the observed values are P , Q , R and S respectively, for each combination of attributes. Explain a test procedure that tests whether level of education is independent of area of residence. (Where $N = P + Q + R + S$). 7
- (ii) State applications of t-distribution. 7
- The measurements of weights (in gms) of 10 rats were recorded before giving a fortified foodstuff and month after a fortified foodstuff was given to rats. Explain the test procedure that tests the hypothesis that there is no significant difference in weights of rats.

OR

- (i) Explain test procedure to test null hypothesis $H_0 : \sigma_1^2 = \sigma_2^2$ against alternative hypothesis $H_1 : \sigma_1^2 < \sigma_2^2$. 7
- (ii) Explain test procedure of testing significance of single mean, stating necessary assumptions. 7
4. (i) Describe test procedure of large sample sign tests. 7
- (ii) Explain in details, Mann Whitney U-test. 7

OR

- (i) What are nonparametric tests ? State differences between parametric and nonparametric tests. 7
- (ii) Define Run. Describe the test procedure of Run Test. 7
5. Answer the following : 14
- (1) What is type – II error ?
- (2) Define Most powerful Critical Region.
- (3) State, out of two types of errors, which one is more serious ?
- (4) Give one example of composite hypothesis.
- (5) What do you mean by large sample ?
- (6) A test statistic defined on a large sample, has a probability distribution, which is approximately normal. Do you agree ?
- (7) State a test statistic for testing a null hypothesis regarding single proportions.
- (8) State a test statistic for testing a null hypothesis regarding two means.
- (9) Which distribution is useful in deriving a test statistic for testing significance of observed multiple correlation coefficient ?

- (10) Give table value of a test statistic used for testing hypothesis concerning single mean, when alternative is one sided, when level of significance is 0.05.
 - (11) Which distribution is useful in deriving a test statistic for testing significance of observed multiple correlation coefficient ?
 - (12) What is power of the test ?
 - (13) State on assumption associated with nonparametric test.
 - (14) State situation, in which median test is useful.
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