8. (a) The demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained :

Days	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
No. of parts demanded	1124	1125	1115	1126	1120	1110

Test the hypothesis that the number of parts demanded does not depend on the day of the week. [The values of chi-square statistic at 5, 6, 7. d.f. are respectively 11.07, 12.59, 14.07 at 5% ℓ.o.s.].

(b) Define Snedecor's F-statistic. Discuss in detail any one application of F-statistic. 6,6

Section–V

9. (a) Differentiate between 'Point' and 'Interval' estimations. Give one example of each. 3

(b) State Neyman-Pearson Lemma. 2

(c) Give any two properties of maximum likelihood estimators. 1

(d) Write down confidence intervals for 'difference of two proportions' and 'difference of two means' in case of large samples. 3

(e) What are the uses of t-statistic ? 2

(f) What do you mean by 'ANOVA'? 1

B.Sc. 4th Semester (Hons.) Common with ID No. 60348
B.Sc. (Old Scheme) Examination, May–2016

MATHEMATICS

Paper–BHM–245 (Opt. (i))

Elementary Interference

Time allowed : 3 hours] *[Maximum marks : 60*

Note : Attempt five questions in all, selecting one question from each of the four Sections (I, II, III and IV) and Section–V is compulsory.

Section–I

1. (a) Define the following terms and give one example of each :

(i) Parameter, (ii) Statistic, (iii) Standard error, and (iv) Sampling distribution.

(b) Let $x_1, x_2, x_3, ..., x_n$ be random sample from a normal population N(μ, 1). Show that $t = \frac{1}{n}\sum x_i^2$ is an unbiased estimator of $\mu^2 + 1$. 6,6

2. (a) Discuss the concepts of 'consistency' and 'efficiency' of estimators. Also give suitable examples.

(b) Let $x_1, x_2, x_3, ..., x_n$ be a random sample from uniform population on [0, θ]. Find the sufficient estimator for θ. 6,6

Section–II

3. (a) Explain the 'method of maximum likelihood' of estimation.

(b) Obtain the M.L.E's for α and β for the rectangular distribution :

$$f(x;\alpha,\beta)=\begin{cases}\dfrac{1}{\beta-\alpha}, & \alpha<x<\beta\\ 0, & \text{elsewhere.}\end{cases}$$ 5,7

4. (a) Differentiate between the following :

(i) Simple and composite hypotheses,

(ii) Null and Alternative hypotheses,

(iii) Type–I and Type–II errors.

(b) Let 'p' be the probability that a coin will fall head in a single toss in order to test $H_0: p=\frac{1}{2}$ against $H_1: p=\frac{3}{4}$. The coin is tossed 6 times and H_0 is rejected if more than 4 heads are obtained. Find 'size' and 'power' of the test. 6,6

Section–III

5. (a) Discuss testing of single mean in case of large samples. Also obtain $(1-\alpha)$ 100% confidence interval for the population mean.

(b) In a certain city A, 25% of a random sample of 900 school-boys had defective eye-sight. In another large city B, 15.5% of a random sample of 1600 school boys had the same defect. Is this difference between the two proportions significant ? Obtain 95% confidence limits for the difference in the population proportions. [Given that $Z_{.05}=1.96$]. 5,7

6. (a) Explain, what do you mean by testing of difference of two means in case of large samples. If the means of two samples of 1,000 and 2,000 members are 67.5 inches and 68.0 inches, respectively, can the samples be regarded as drawn from the same population of standard deviation 2.5 inches ? [Given that $Z_{.01}=2.33$]

(b) What is Fisher's Z-transformation ? Give its uses. 8,4

Section–IV

7. (a) Define chi-square statistic. Discuss chi-square test for 'goodness of fit'.

(b) The height of 10 males of a given locality are found to be 70, 67, 62, 68, 61, 68, 70, 64, 64, 66 inches. Is it reasonable to believe that the average height is greater than 64 inches ? [Given that $t_9(0.05)=1.833$ for one-tail test]. 6,6