division. Are these figures commensurate with the general examination result which is in the ratio of 4:3:2:1 for various categories respectively ?

(b) A die is thrown 60 times with following results :

| Face | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Frequency | 8 | 7 | 12 | 8 | 14 | 11 |

Test at 5 % level of significance if the die is unbiased, assuming that $P(\chi^2 > 11) = 0.05$ with 5 d.f.

**8.** (a) The mean weekly sales of soap bars in departmental stores was 146.3 bars per store. After an advertising the mean weekly sales in 22 stores for a typical week increased to 153.7 and showed a standard deviation of 17.2 was the advertising campaign successful ?

(b) Write a short note on "Anova for one way classified data."

**UNIT – V**

**9.** (a) Write a short note on Efficiency.

(b) Write a short notes on Sufficiency.

(c) Write a short note on ***one*** tailed and ***two*** tailed tests.

(d) Define level of significance.

(e) Write a short note on estimation of a single proportion.

(f) Write a short note on Analysis of variance two way classified data.



*Roll No.* .....

# 41255

## B. Sc. (Hons.) Mathematics 4th Semester Examination – May, 2019

### ELEMENTARY INFERENCE

**Paper : BHM245 Opt-i**

*Time : Three hours ]* *[ Maximum Marks : 60*

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

***Note :*** Attempt ***five*** questions in all, selecting ***one*** question from each Section. Question No. 9 (Unit – V) is ***compulsory***.

**UNIT – I**

**1.** (a) Define Parameter and Statistic. Also define sampling distribution and standard error of estimate.

(b) For the geometric distribution, $f(x,0) = 0\,(1-0)^{x-1}$, $x = 1,2,\ldots\ldots$, $0 < 0 < 1$. Obtain an unbiased estimator of $\frac{1}{0}$.

**2.** (a) Let $\{T_n\}$ be a sequence of estimators such that for all $\theta \in \Theta$ :

(i) $E_\theta(T_n) \to r(\theta)$ as $n \to \infty$

(ii) $\text{var}_\theta(T_n) \to 0$ as $n \to \infty$

Then $T_n$ is a consistent estimator of $r(\theta)$.

(b) A random sample $(X_1, X_2, X_3, X_4, X_5)$ of size 5 is drawn from a normal population with unknown mean $\mu$. consider the following estimators to estimate $\mu$ :

(i) $t_1 = \dfrac{X_1 + X_2 + X_3 + X4 + X_5}{5}$

(ii) $t_2 = \dfrac{X_1 + X_2}{2} + X_3$

(iii) $t_3 = \dfrac{2X_1 + X_2 + \lambda \times X_3}{3}$ where $\lambda$ is such that $t_3$ is an unbiased estimator of $\mu$. Find $\lambda$. Are $t_1$ and $t_2$ unbiased ? State giving reasons, the estimator which is best amoung $t_1$ , $t_2$ and $t_3$.

**UNIT – II**

**3.** (a) Find the maximum likelihood estimate for the parameter $\lambda$ of a Poisson distribution on the basis of a sample of size n. Also find its variance.

(b) Explain the following Terms

(i) Null hypothesis and atternative hypothesis

(ii) Type I and Type II errors

**4.** (a) State and prove Neyman - pearson lemma

(b) Let $x_2$ $N(\mu, u)$, $\mu$ unknown. To test $H_0 : \mu = -1$ against $H_1 : \mu = 1$, based on a sample of size 10 from this population, we use the critical region





$x_1 + 2x_2 + ..... + 10x_{10} \geq 0$. What is its size ? Wh is the power of the test ?

**UNIT – III**

**5.** (a) In a sample of 1,000 people in Goa , 540 are ric eaters and the rest are wheat eaters. Can w assume that both rice and wheat are equall popular in this state at 1 % level of significance ?

(b) The guaranteed average left of a certain type o electric light bulbs is 1,000 hours with a standar deviation of 125 hours. It is decided to sample th output so as to ensure that 90% of the bulbs do no fall short of the guaranteed average by more than 2.5%. What must be maximum size of the sample ?

**6.** (a) In a survey of buying habits, 400 women shoppers are chosen at random in super market 'A' located in a certain section of the city. Their average weekly food expenditure is Rs. 250 with a standard deviation of Rs. 40, Far 400 women shoppers chosen at random in super market B in another section of the city, the average weekly food expenditure is Rs. 220 with a standard deviation of Rs. 55 Test at 1% level of significance whether the average weekly food expenditure of two population of shoppers are equal.

(b) What are Applications of Z- transformation.

**UNIT – IV**

**7.** (a) A sample analysis of examination results of 200 MBA's was made. It was found that 46 student had faited, 68 secured a IIIrd division, 62 secured a IInd division and the rest were placed in first