

## FACULTY OF INFORMATICS

M.C.A. (CBCS) II-Semester (Backlog) (2019-2020 Batch) (New)

Examination, April 2022

Subject: Probability and Statistics

Time: 3 Hours

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

**Note: Answer any five questions from the following. All questions carry equal marks.**

1. These data represent the ages of patients admitted to a small hospital on February 28, 1996:

85 75 66 43 40  
 88 80 56 56 67  
 89 83 65 53 75  
 87 83 52 44 48

- i) Construct a frequency distribution with classes 40-49, 50-59, etc.
- ii) Compute the sample mean from the frequency distribution
- iii) Compute the sample mean from the raw data.

2. Talent, Ltd., a Hollywood company is selecting a group of extras for a movie. The ages of the first 20 men to be interviewed are

50	56	55	49	52	57	56	57	56	59
54	55	61	60	51	59	62	52	54	49

The director of the movie wants men whose ages are family tightly grouped around 55 years. Being a statistics buff of sorts, the director suggests that a standard deviation of 3 years would be acceptable. Does this group of extras qualify?

3. a) If A, B, C are any three events, then prove that  

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$$
- b) A Class consists of 6 girls and 10 boys. If a committee of 3 is chosen at random from the class, find the probability that i) 3 boys are selected ii) exactly 2 girls are selected.
4. a) Let X denote the number of heads in a single toss of 4 fair coins. Determine  
 i)  $P(X < 2)$   
 ii)  $P(1 < X \leq 3)$ .
- b) Find the mean and standard deviation of sampling distribution of variances for the population 2,3,4,5 by drawing samples of size two with replacement.
5. a) What is the size of the smallest sample required to estimate an unknown proportion to within a minimum error of 0.06 with at least 95% confidence.
- b) A die is tossed 960 times and it falls with 5 upwards 184 times. Is the die unbiased at a level of significance of 0.01?

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6. a) A manufacturer claimed that at least 95% of the equipment which he supplied to a factory confirmed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 were faulty. Test his claim at 5% level of significance.  
 b) In two large populations, there are 30% and 25% respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations?
7. a) A manufacturer claims that any of his list of items cannot have variance more than  $1\text{ cm}^2$ . A sample of 25 items has a variance of  $1.2\text{ cm}^2$ . Test whether the claim of the manufacturer is correct.  
 b) Define Chi-Square distribution and properties of Chi-square distribution.
8. Four methods are under development for making discs of a super conducting material. Fifty discs are made by each method and they are checked for super conductivity when cooled with liquid.

	1 <sup>st</sup> method	2 <sup>nd</sup> method	3 <sup>rd</sup> method	4 <sup>th</sup> method
Super conductors	31	42	22	25
Failures	19	8	28	25

Test the significant difference between the proportions of super conductors at 0.05 level.

9. a) Find if there is any significant correlation between the heights and weights given below.

Heights in Inches	57	59	62	63	64	65	55	58	57
Weight in lbs	113	117	126	126	130	129	111	116	112

- b) From a sample of 200 pairs of observation the following quantities were calculated.

$$\sum X = 11.34, \sum Y = 20.78, \sum X^2 = 12.16, \sum Y^2 = 84.96, \sum XY = 22.13.$$

From the above data show how to compute the coefficient of the equation  $Y = a + bX$ .

10. a) Determine the equation of a straight line which best fits the data.

X :	10	12	13	16	17	30	25
Y :	10	22	24	27	29	33	37

- b) Given the following set of data i) Calculate the multiple regression plane and ii) predict  $Y$  when  $X_1 = 3.0$  and  $X_2 = 2.7$ .

$Y$	25	30	11	22	27	19
$X_1$	3.5	6.7	1.5	0.3	4.6	2.0
$X_2$	5.0	4.2	8.5	1.4	3.6	1.3

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