Enrollment No._____

NAVRACHANA UNIVERSITY
a UGC recognized University

School: School of Engineering and Technology
Program/s: BCA/BSC(DS)
Year: I **Semester:** II
Examination: End Semester Examination
Examination year: May 2023

Course Code: MAT201 **Course Name:** **Foundations in Statistics**
Date: 18/05/2023
Time: 02.00 to 04.00 pm

Total Marks: 40
Total Pages: 1

Instructions:

- *Write each answer on a new page.*
- *Use of a calculator is permitted*
- ** COs=Course Outcome mapping. # BTL=Bloom's Taxonomy Level mapping*

Q. No.	Details	Marks	COs *	BTL #
Q. 1	**Answer the following:** **[1x10=10 marks]** **1.** Relative frequency of a class = _____, where f is the frequency of the class and $\sum f$ is the sum of the frequencies of all the classes in the data **2.** Last year's incomes of five randomly selected families were \$76,150, \$95,750, \$124,985, \$87,490, and \$53,740. Find the mode **3.** If Q_1, Q_2, Q_3 are the first, second and third quartiles respectively, then the interquartile range is defined as _____. **4.** Drawing 3 balls without replacement from a box that contains 10 balls, 6 of which are red and 4 are blue, and observing the colors of the drawn balls is not a binomial experiment (True/False) **5.** For the standard normal distribution, find the area within one standard deviation of the mean—that is, the area between $\mu-\sigma$ and $\mu+\sigma$. **6.** The random variable χ^2 assumes only a. positive **b.** nonnegative **c.** nonpositive values **7.** The degrees of freedom for a test of independence are a. $(R-1)(C-1)$ **b.** $n-2$ **c.** $(n-1)(k-1)$ **8.** A Type I error is committed when _____. **9.** A critical value is the value **a.** calculated from sample data **b.** determined from a table **c.** neither a nor b **10.** Find the z value for each of the following x value for a normal distribution with $\mu=30$ and $\sigma=5$ for $x=39$.	**10**	CO1 CO2 CO3 CO4	BT1, BT2
Q. 2	**1.** The mean age of six persons is 46 years. The ages of five of these six persons are 57, 39, 44, 51, and 37 years, respectively. Find the age of the sixth person. **2.** A sample was selected of 506 workers who currently receive two weeks of paid vacation per	**10**	CO1, CO2 CO3 CO4	BT1, BT3, BT4 BT6

year. These workers were asked if they were willing to accept a small pay cut to get an additional week of paid vacation a year. The following table shows the responses of these workers

	Yes	No	No Response
Man	77	140	32
Woman	104	119	34

Are the events "woman" and "yes" mutually exclusive? Explain why or why not.

3. A high school boys' basketball team averages 1.2 technical fouls per game. Using the appropriate formula, find the probability that in a given basketball game this team will commit exactly 3 technical fouls.

4. Find the mean and standard deviation of this binomial distribution for which $n = 80, p = .50$.

5. Define a multinomial experiment. Give an example.

6. In a *USA TODAY* survey, registered dietitians with the American Dietetic Association were asked, "What is the major reason people want to lose weight?" The responses were classified as *Health* (H), *Cosmetic* (C), and *Other* (O). Suppose a random sample of 20 dietitians is taken and these dietitians are asked the same question. Their responses are as follows

H	H	C	H	O	C	C	H	C	O
O	H	C	H	H	C	H	H	O	H

Draw a pie chart for the percentage distribution

Q. 3 **Attempt any 2 questions. (5 Marks each)** — **10** — CO1 CO2 CO3 CO4 CO5 — BT3, BT4 BT5

1. The following data give the amounts spent on video rentals (in dollars) during 2009 by 30 households randomly selected from those who rented videos in 2009

595	24	6	100	100	40	622	405	90	55	155	760	405	90	205
70	180	88	808	100	240	127	83	310	350	160	22	111	70	15

a. Construct a frequency distribution table. Take \$1 as the lower limit of the first class and \$200 as the width of each class.

b. Calculate the relative frequencies and percentages for all classes.

c. What percentage of the households in this sample spent more than \$400 on video rentals in 2009?

2. Suppose the life span of a calculator manufactured by Texas Instruments has a normal distribution with a mean of 54 months and a standard deviation of 8 months. The company guarantees that any calculator that starts malfunctioning within 36 months of the purchase will be replaced by a new one. About what percentage of calculators made by this company are expected to be replaced? (Given the area under the normal curve for $z < -2.25$ is 0.0122).

3. What are the five steps of a test of hypothesis using the critical value approach? Explain briefly

Q. 4 **Attempt any 1 question (10 marks)** — **10** — CO3, CO4 — BT2, BT3, BT4 BT6

Surfer Dude swimsuit company plans to produce a new line of quick-dry swimsuits. Three textile companies are competing for the company's quick-dry fabric contract. To check the fabrics of the

three companies, Surfer Dude selected 10 random swatches of fabric from each company, soaked them with water, and then measured the amount of time (in seconds) each swatch took to dry when exposed to sun and a temperature of 80 degree F. The following table contains the amount of time (in seconds) each of these swatches took to dry

Company A	756	801	750	777	772	768	812	770	743	82
Company B	791	696	761	760	741	810	770	823	815	84
Company C	773	794	733	740	780	801	794	719	766	74

Using ANOVA, at 5% significance level, test the null hypothesis that the mean drying times for all such fabric produced by the three companies are the same. (The critical value of F distribution at .05 LOS for df = (2,27) is 3.35)

2. A bank has an ATM installed inside the bank, and it is available to its customers only from 7 AM to 6 PM Monday through Friday. The manager of the bank wanted to investigate if the number of transactions made on this ATM are the same for each of the 5 days (Monday through Friday) of the week. She randomly selected one week and counted the number of transactions made on this ATM on each of the 5 days during this week. The information she obtained is given in the following table, where the number of users represents the number of transactions on this ATM on these days. For convenience, we will refer to these transactions as "people" or "users."

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Number of users	253	197	204	279	267

a) At the 1% level of significance, can we reject the null hypothesis that the number of people who use this ATM each of the 5 days of the week is the same? Assume that this week is typical of all weeks in regard to the use of this ATM.(Critical value of χ^2 is 13.277 at -.01 LOS and df = 4)

**********End of Question Paper**********