

Spring Semester End Examination 2019  
Royal University of Bhutan  
Paro College of Education  
Paro: Bhutan

**Module:** MAT410 (Inferential Statistics)    **Program:** B.Ed. (Secondary)    **Level:** IV  
**Writing Time:** Three Hours    **Full Marks:** 100

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**Instructions:** In this paper there are two sections- Section A and B. You are required to answer ALL questions from section A and only FIVE questions from section B. Do not write for the first 15 minutes; use this time for reading the questions. You will get three hours for answering the questions. Write the answers to all the questions in the answer sheets provided. Read the directions to each section and each question carefully before answering the questions. You are allowed to use calculator in this paper.

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**SECTION A**  
ONE Question-20 Marks

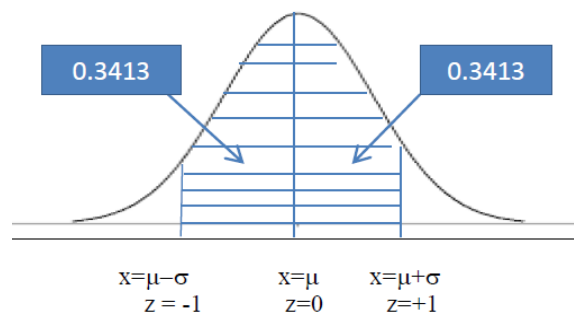
**Question 1**

**Direction:** Answer all the sub-questions. Each item under this question is followed by four alternative possible answers. Choose the correct answer and write it in the answer sheets provided.

- a. Which experiment does NOT have equally likely outcomes?
  - A Rolling a die
  - B Tossing a coin
  - C Choosing a number at random from 1 to 50
  - D Choosing a letter at random from the word TOOLS
  
- b. For testing hypothesis at 0.01 level of significance, the size of the critical region taken on one side of the mean is
  - A 0.025
  - B 0.475
  - C 0.050
  - D 0.495
  
- c. Which formula defines the mean of the binomial distribution?
  - A  $\sqrt{npq}$
  - B  $np$
  - C  $\sqrt{np}$
  - D  $npq$

- d. What is the probability of the area under the normal curve that falls within  $\pm 2\sigma$  ordinates of the mean?
- A 0.6827
  - B 0.9546
  - C 0.9973
  - D 0.9673
- e. If an alternative hypothesis states that  $H_A: \mu > \mu_0$ , then the critical value for a 5% significance level is
- A +2.58
  - B +1.96
  - C -2.58
  - D -1.64
- f. The correct procedure to determine the  $\chi^2$  test statistic is
- |                                     |                             |
|-------------------------------------|-----------------------------|
| I. Drawing the conclusion           | II. Creating the hypotheses |
| III. Computation of $\chi^2$ value. | IV. Computation of $f_e$ .  |
- A I, II, III & IV
  - B II, IV, III, & I
  - C IV, III, II & I
  - D III, II, IV & I
- g. A spinner has 5 equal sectors numbered 1 to 5. If you spin the spinner, then which of the following is NOT a certain event?
- A Landing on a multiple of 4
  - B Landing on a greater than 1
  - C Landing on a number less than 5
  - D Landing on a multiple of 2 greater than 4
- h. Which is NOT an example of discrete random variables?
- A Number of calls
  - B Shares of stock
  - C People in a queue
  - D Time that a bus arrives at a specified stop

- i. In a binomial distribution, if  $p = q = 0.5$ , then its nature can be described as
- A symmetric.
  - B asymmetric.
  - C negatively skewed.
  - D positively skewed.
- j. The area between the ordinates  $\mu - \sigma$  and  $\mu + \sigma$  cannot be represented by the statement



- A  $p(-1 < z < +2)$ .
- B  $2p(0 < z < 1)$ .
- C  $p(\mu - 1 < x < \mu + 1)$ .
- D  $p(\mu - 1 < z < \mu + 1)$ .

**SECTION B**  
**FIVE Questions – 80 Marks**

**Instructions:** There are SIX questions in this section. Answer any **FIVE** questions. All questions carry equal marks. The intended mark for each sub-question is given in the brackets.

**Question 2**

- a. Explain the concept of ‘dependent’ and ‘independent’ events giving appropriate examples. (4)
- b. In a certain school, 60% of all students engaged in playing football, 50% of all students in basketball and 30% of all students in both football and basketball. If a student is selected at random, what is the probability that:
  - i. he or she plays both football and basketball? and
  - ii. he or she plays neither of sports? (6)
- c. In an engineering college, 25% of the boys and 10% of the girls are studying Civil Engineering. The girls constitute 60% of the students. If a student is selected randomly and is studying Civil Engineering, determine the probability that the student is a girl. (6)

**Question 3**

- a. Differentiate between ‘discrete random variables’ and ‘continuous random variables.’ Give two examples each. (4)
- b. A random variable Y has the probability distribution shown below: (8)

y	1	2	3	4
P(Y=y)	0.13	a	0.38	b

Given  $E(Y) = 1.5$ , find the value of ‘a’ and ‘b.’

- c. A random variable X is defined as ‘the sum of the scores shown by two fair six-sided dice.’ Tabulate the probability distribution of X. (4)

#### Question 4

- a. What are the conditions required to generate a binomial probability distribution? (5)
- b. Derive the binomial distribution, using the binomial distribution table for the number of trials ( $N = 6$ ) and plot its graph. (5)
- c. The average percentage of failures in a certain examination is 40. What is the probability that out of 6 groups of students that least 4 passed in examination? (6)

#### Question 5

- a. Describe the distribution of area under the standard normal curve within the limits of  $\pm 3\sigma$ . Illustrate it using an appropriate diagram. (4)
- b. A normally distributed data set has a mean of 77. Find its standard deviation, if 20% of the area under the curve lies to the right of 90. (4)
- c. A sales tax officer had reported that the average sales of 500 business houses he had to deal with during a year amount to Nu. 36,000 with a standard deviation of Nu.10, 000. Assuming that the sales of these business houses are normally distributed, find the percentage of business houses the sales of which are likely to range between Rs.30,000 and Rs.40,000. (8)

#### Question 6

- a. What is a sampling distribution of the mean? Explain briefly with appropriate examples. (5)
- b. A random sample of 400 items is found to have a mean of 82 and standard deviation 18. Find the 95% confidence limits for the mean of the population from which the sample is drawn. (5)
- c. A random sample of 1000 workers from Thimphu shows that their mean wages are Nu.47 per week with standard deviation of Nu.28. A random sample of 1500 workers from Phuntsholing gives a mean wage of Nu.49 and standard deviation of Nu.40. Is there a significant difference between their mean levels of wage? (6)

### Question 7

- a. What do you understand by the term ‘contingency table?’ Discuss using an appropriate data set. (5)
- b. In a certain town 100 persons were randomly chosen and interviewed for their educational stature. The results are given in the table below. (8)

	Education			
Sex	Middle School	High School	College	Total
Male	10	15	25	50
Female	25	10	15	50
Total	35	25	40	100

Does education depend on the sex of the individual? Use 5% level of significance.

- c. Observe the chi-square distribution curves in Figure 1 carefully. What can you conclude about the relationship between the chi-squared distribution and the normal distribution? (3)

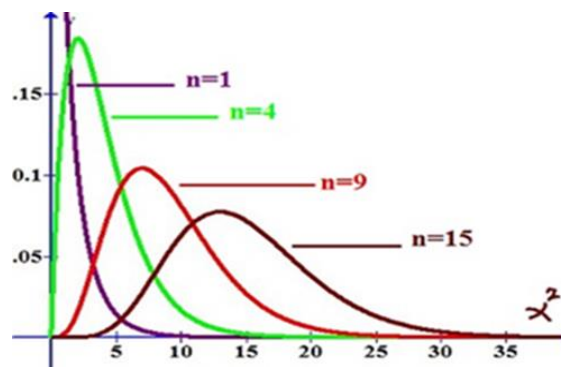


Figure 1: The Chi Square Distribution