

Spring Semester Examination 2018  
Royal University of Bhutan  
Paro College of Education  
Paro: Bhutan

**Module:** MAT410 (Inferential Statistics)    **Programme:** B.Ed (Secondary)    **Level:** IV

**Writing Time:** Three Hours

**Full Marks:** 100

**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 full 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**

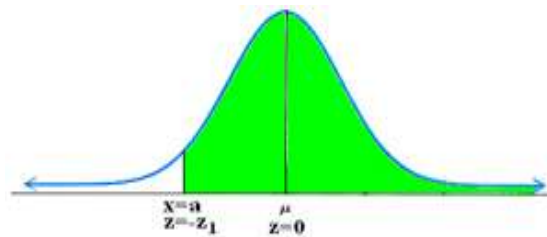
**Direction:** Answer all the sub-questions. Each sub-question under this question is followed by four alternative possible answers. Choose the correct answer and write it in the answer sheets provided.

- a. Which of the following experiment does NOT have equally likely outcomes?
  - A Roll a dice
  - B Toss a coin
  - C Choose a number at random from 1 to 10
  - D Choose a letter at random from the word SCHOOL
  
- b. For testing hypothesis at 1% level of significance, the size of the critical region taken on both sides of the mean together is
  - A 0.025
  - B 0.475
  - C 0.050
  - D 0.495
  
- c. Which formula defines the variance of the binomial distribution?
  - A  $\sqrt{npq}$
  - B  $np$
  - C  $\sqrt{np}$
  - D  $npq$

- d. What approximate percentage of the area under the normal curve falls within  $\pm 3$  SD of the mean?
- A 68.27%
  - B 95.4%
  - C 99.73%
  - D 96.73%
- e. If an alternative hypothesis states that  $H_A : \mu > \mu_0$ , then the critical value for a 1% significance level is
- A +2.58
  - B +1.96
  - C -2.58
  - D -1.64
- f. Which is the correct procedural sequence to determine the  $\chi^2$  test statistic?
- |                                     |                             |
|-------------------------------------|-----------------------------|
| 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 7 equal sectors numbered 1 to 7. If you spin the spinner, then which of the following is NOT a certain event?
- A Landing on a number less than 7
  - B Landing on a number greater than 8
  - C Landing on a number greater than 1
  - D Landing on a number greater than 2
- h. Which is NOT an example of discrete random variables?
- A Number of calls
  - B Shares of stock
  - C People in a que
  - D Time that a bus arrives at a specified stop

- i. In a binomial distribution, if  $p = q = 0.5$ , then the nature of the distribution is
- A symmetric.
  - B asymmetric.
  - C negatively skewed.
  - D positively skewed.

- i. Which notation can be represented by the shaded portion of the figure below?



- A  $0.5 + p(0 < Z < Z_1)$
- B  $0.5 - p(0 < Z < Z_1)$
- C  $0.5 + p(0 > Z > Z_1)$
- D  $0.5 + p(0 < Z < Z_2)$

## SECTION B

FIVE Questions – 80 Marks

**Instruction:** 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. Define the term ‘conditional probability’ giving two appropriate examples. (4)
- b. In a certain college, 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? (3 + 3)
- c. At Dr. Kaka School, 25% of the boys and 10% of the girls are studying Rigzhung. The girls constitute 60% of the students. If a student is selected randomly and is studying Rigzhung, determine the probability that the student is a girl. (6)

### Question 3

- a. Show that  $\text{var}(ax) = a^2 \text{var}(x)$  where 'a' is a constant (4)
- b. A random variable Y has the probability distribution shown below: (6)

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 and draw an appropriate graph. (6)

### Question 4

- a. What are the conditions which are 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 probability of 'khurus' hitting a target is  $\frac{1}{5}$ . Two khurus are enough to win a game. If 6 khurus are aimed at winning the game, what is the probability that the game is won? (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. (5)
- 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. (5)
- c. The mean daily sale of 500 business companies was Nu.150,000 with standard deviation of Nu.15000. Assuming the normal distribution, find the number of companies which have sales between Nu.140,000 and Nu.165,000. (6)

### Question 6

- a. Describe the term 'Chi-Square Goodness-of-Fit Test.' Enlist the general procedural steps to conduct a chi-square test. (6)
- b. In a certain town 100 persons were randomly chosen and interviewed for their educational stature. The results are given in the table below. (7)

Sex	Education			Total
	Middle School	High School	College	
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 shown in the figure 1. What can you conclude about its relationship with a normal distribution? (3)

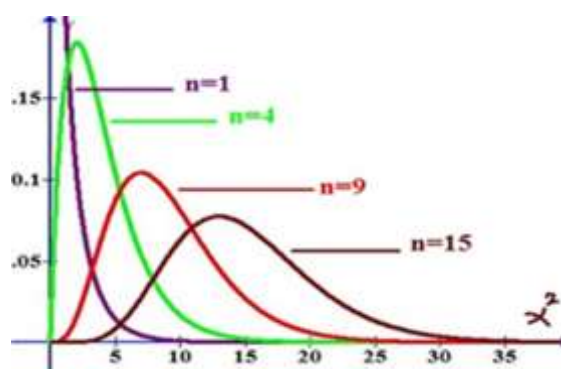


Figure 1: The Chi Square Distribution

### Question 7

- a. Explain the term 'parameters' and 'statistics' in sampling theory, giving three examples each. (4)
- b. Tashi, as a computing typist claims that on an average he can type 120 words per minute. At 5% level of significance, can we reject his claim on the basis of 100 trials in which he demonstrates a mean of 116 words with s.d of 15 words? (5)
- c. In a certain school there are 6<sup>th</sup> graders and 7<sup>th</sup> graders. The average weight of students in a sample of 250 in 6<sup>th</sup> graders was found to be 120 kg with s.d of 12 kg. While the corresponding figures in a sample of 400 students from 7<sup>th</sup> graders were 124 kg and 14 kg. Is the difference significant? Also find 99% confidence limits for the average weight of students in the sample of 6<sup>th</sup> graders. (7)