

ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2013
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALIZATION PAPER for *STATISTICS*

Date	: 14 October 2013
Total Marks	: 100
Examination Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

GENERAL INSTRUCTIONS:

1. Write your Roll Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A and SECTION B:
 - **SECTION A** has two parts: Part I -30 Multiple-Choice Questions
Part II -4 Short Answer Questions
All questions under SECTION A are COMPULSORY.
 - **SECTION B** consists of two Case Studies. Choose only ONE case study and answer the questions under your choice.
4. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating any or correct Section, Part and Question Number will NOT be evaluated and no marks would be awarded.
5. Begin each Section and Part in a fresh page of the Answer Booklet.
6. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
7. Use of any other paper including paper for rough work is not permitted.
8. You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.
9. This paper has **08** printed pages in all, including this instruction page.

GOOD LUCK!

SECTION A

PART I - Multiple Choice Questions (30 Marks)

Choose the correct answer and write down the letter of the correct answer chosen in the Answer Booklet against the question number. E.g. 31 (c). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. The weights of students in a class are an example of
 - a) Discrete variables
 - b) Continuous variables
 - c) None of the above
 - d) Both the above

2. Given the age of 6 children as 3, 6, 4, 7, 9 and 8. The median age is
 - a) 4
 - b) 7
 - c) 6.5
 - d) 7.5

3. The measure which is most affected by addition of extreme measurements is
 - a) Mean
 - b) Median
 - c) Mode
 - d) None of the above

4. Find the midrange of this sample of scores in class X exams. The sample had the smallest observation of 426 and largest at 740.
 - a) 314
 - b) 583
 - c) 740
 - d) 426

5. Find the variance of the sample of observations 2, 5, 7, 9, 12?
 - a) 11.16
 - b) 10
 - c) 8
 - d) None of the above

6. What can be said about a sample of observations whose standard deviation is zero?
- a) The n observations are equally distant from the mean
 - b) The n observations are equal to the mean
 - c) None of the above
 - d) Both the above

7. When analyzing sample surveys weights are used. This is done to

- a) Make indicators representative at domain level
- b) Make sample data more error free
- c) None of the above
- d) Both the above

8. Negatively skewed data means

- a) Data is evenly spread
- b) Extreme values in the upper half of the curve
- c) Extreme values in the lower half of the curve
- d) None of the above

9. In how many ways may 3 books be placed next to each other on a shelf?

- a) 9 different ways
- b) 7 different ways
- c) 6 different ways
- d) 3 different ways

10. A deck of playing cards is thoroughly shuffled and a card is drawn from the deck. What is the probability that the card drawn is the ace of diamond?

- a) $\frac{1}{13}$
- b) $\frac{1}{4}$
- c) $\frac{1}{52}$
- d) None of the above

11. In a single throw of a single dice, find the probability of obtaining either a 2 or a 5.

- a) $\frac{1}{2}$
- b) $\frac{1}{6}$
- c) $\frac{1}{3}$
- d) None of the above

12. A committee is composed of six PDP and five DPT NA members. Three of the PDP members are men and 3 of DPT members are men. If a man is chosen for chairman, what is the probability that he is a DPT member?

- a) $\frac{5}{11}$
- b) $\frac{6}{11}$
- c) $\frac{1}{2}$
- d) None of the above

13. For nationwide studies, the usual sampling methodology adopted is

- a) Simple Random Sampling
- b) Multi-stage sampling
- c) Circular Systematic Sampling
- d) None of the above

14. The total of all probabilities in a sampling distribution is always

- a) 100
- b) 1
- c) None of the above
- d) Both the above

15. Any normal distribution has what percent of the distribution within one standard deviation of the mean?

- a) 95.44%
- b) 68.26%
- c) None of the above
- d) Both the above

16. A psychologist wishes to determine the variation in I.Q.s of the population in his city. He takes many random samples of size 64. The standard error of the mean is found to be equal to 2. What is the population standard deviation?

- a) 14
- b) 15
- c) 16
- d) 17

17. The term unbiased estimator means

- a) $E(\theta) = \frac{\theta}{n-1}$
- b) $E(\theta) = \theta$
- c) None of the above
- d) Both the above

18. Many types of variables in the social sciences such as scales measuring prestige, political efficacy, prejudice or political orientation are

- a) Nominal level variables
- b) Ordinal level variables
- c) Interval level variables
- d) None of the above

19. A magazine printed a survey in its monthly issue and asked readers to fill it out and send it in. Over 1000 readers did so. This type of sample is called

- a) A cluster sample
- b) A self-selected sample
- c) A stratified sample
- d) A simple random sample

20. Principal component analysis is used to transform a given set of observed variables into another set of variables whose

- a) Variance can be more easily explained
- b) Mean can be more easily explained
- c) None of the above
- d) Both the above

21. A parameter is

- a) Summary measure to describe a characteristic of the population
- b) Summary measure to describe a characteristic of the sample
- c) Totality of things under consideration
- d) Proportion of population selected for analysis

22. Which of the following is an example of a discrete distribution?

- a) Poisson density function
- b) Exponential density function
- c) Normal; density function
- d) None of the above

23. If the covariance between two random variables X and Y is zero, then

- a) X and Y are dependent
- b) X and Y are independent

- c) X and Y move in the same direction
d) None of the above
24. If we change the confidence level from 97 percent to 96 percent when constructing a confidence interval for the population mean, we can expect the size of the interval to
- a) Decrease
b) Increase
c) Stay the same
d) None of the above
25. The variability is maximum for proportions when the value of p is
- a) 0.05
b) 0.25
c) 0.5
d) 0.75
26. The following equation is provided: $\hat{y} = b_0 + b_1x$. Here b_1 refers to
- a) Dependent variable
b) Independent variable
c) Intercept
d) Slope
27. In conducting surveys, which statement given below is true?
- a) Stratification is determined first
b) Sample size is determined first
c) Sample allocation is determined first
d) Domain identification is determined first
28. Coefficient of variation is defined as
- a) $\frac{s}{\sqrt{n}}$
b) $\frac{s}{\bar{x}}$
c) $\frac{\bar{x}}{s}$
d) None of the above
29. The GDP of a country can be estimated by which of the following method?
- a) Expenditure approach
b) Income approach
c) Production approach
d) All the above

30. Poverty determination in Bhutan follows the World Bank's methodology of Cost of Basic Needs Approach. Currently Bhutan bases it on

- a) Income
- b) Expenditure
- c) None of the above
- d) Both the above

PART – II : Short Answer Questions (20 marks)

Answer ALL the questions. Each question carries 5 marks.

1. If a random variable X is normally distributed with a mean of 118 and a standard deviation of 11, what z-score correspond to raw score of 115?
2. If a distribution has a mean of 15 and a standard deviation of 2, what z score corresponds to a raw score of 19?
3. There are two roads between towns A and B. There are three roads between towns A and C. How many different routes may one travel between towns A and C.
4. Let X be the random variable defined as the number of dots observed on the upturned face of a fair die after a single toss. Find the expected value of X .

SECTION B

Case Study

Choose either Case 1 or Case 2 from this Section. Each Case carries 50 marks.

CASE 1

The new government has said that they are going to look at poverty not only from income point of view but to measure Multidimensional Poverty Index (MPI). If you are asked to design a survey on measuring MPI, how will you proceed? Give detailed description of the following:

- (a) Survey plan
- (b) List of indicators that you would need to generate MPI
- (c) Questionnaire design;
- (d) Sampling methodology and
- (e) Tabulation and analysis plans.

CASE 2

An experimenter tested for differences in attitudes towards smoking before and after a film on lung cancer was shown. He found a difference which was significant between the 0.05 and 0.02 levels.

- (a) What is the assumed hypothesis in words?
- (b) Which level of significance indicates the greater degree of significance, 0.05 or 0.02?
- (c) If his α level is 0.05, will he reject H_1 ? Will he reject it if employs the 0.02 level? In choosing $\alpha = 0.02$ instead of $\alpha = 0.05$, he increases the risk of making one of the two types of error. Which type?