

Roll No. Answer Sheet No. 44

Sig. of Candidate. \_\_\_\_\_

Sig. of Invigilator. \_\_\_\_\_

## STATISTICS HSSC-II

### SECTION – A (Marks 17)

Time allowed: 25 Minutes

**NOTE:** Section–A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

**Q. 1** Circle the correct option i.e. A / B / C / D. Each part carries one mark.

- (i) Which of the following statement is correct?  
A.  $A \cap A = \phi$  B.  $A \cap A = A'$  C.  $A \cup A = A$  D.  $A \cap A = S$
- (ii) What is  ${}^n C_n$ ?  
A. 0 B. 1 C.  $n$  D. It cannot be determined
- (iii) If  $A$  and  $B$  are not mutually exclusive events, then:  
A.  $P(A \cup B) = P(A) + P(B)$  B.  $P(A \cap B) = P(A) + P(B)$   
C.  $P(A \cup B) = P(A)P(B)$  D.  $P(A \cup B) + P(A \cap B) = P(A) + P(B)$
- (iv) The probability of an event cannot be:  
A. 1 B.  $> 0$  C.  $< 0$  D. = 1
- (v) A random variable is also known as:  
A. Chance variable B. Kurtosis  
C. Population D. Null hypothesis
- (vi) If  $X$  and  $Y$  are random variables, then  $E(X - Y)$  is equal to:  
A.  $E(X) + E(Y)$  B.  $E(X) - E(Y)$  C.  $X - E(X)$  D.  $E(X) - Y$
- (vii) Variance of  $(q + p)^3$  is:  
A.  $\sqrt{3pq}$  B.  $3pq$  C.  $3p$  D.  $\sqrt{3p}$
- (viii) If  $Z \sim N(0,1)$ , then coefficient of variation is equal to:  
A. 0.50 B. 1 C. 0 D.  $\infty$
- (ix) The mean deviation of the normal distribution is:  
A.  $0.6745 \sigma$  B.  $0.5959 \sigma$  C.  $0.7979 \sigma$  D.  $0.8989 \sigma$
- (x) For a normal distribution with  $\mu = 10, \sigma = 2.5$ , the area to the right of 10 is equal to:  
A. 1 B. 0.5 C. 0.25 D. 0.75
- (xi) In sampling without replacement, an element can be chosen:  
A. Less than once B. Only once C. More than once D. Difficult to tell
- (xii) A population contains two items and four items are selected at random with replacement, then possible samples are:  
A. 16 B. 8 C.  ${}^4 C_2$  D. 4
- (xiii) A sample of size  $n$  is called a small sample if  $n$  is:  
A. Less than 30 B. Greater than or equal to 30  
C. Equal to 30 D. Less than or equal to 30
- (xiv) In a z-test degree of freedom is:  
A.  $n - 1$  B.  $n - 2$  C.  $n_1 + n_2 - 2$  D. Not possible
- (xv) The limits of  $\chi^2$  distribution are:  
A.  $-1$  to  $+1$  B. 0 to 1 C.  $-1$  to 0 D. 0 to  $\infty$
- (xvi) The most common output devices are:  
A. Monitor and Printer B. Keyboard  
C. Mouse D. CPU
- (xvii) Super computers can process billion of instructions:  
A. Per micro second B. Per second  
C. Per minute D. Per hour

For Examiner's use only:

Total Marks:

17

Marks Obtained:



# STATISTICS HSSC-II

45

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

NOTE: Answer any fourteen parts from Section 'B' and any two questions from Section 'C'. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly. Statistical table will be provided on demand.

### SECTION - B (Marks 42)

Q. 2 Attempt any FOURTEEN parts. All parts carry equal marks. (14 x 3 = 42)

- (i) Let  $A = \{1,2\}$ ,  $B = \{2,3\}$  of the universal set  $S = \{1,2,3\}$ . Determine the elements of the sets:
  - (a)  $A \times B$
  - (b)  $B \times A$
  - (c)  $(A \times B) \cup (B \times A)$
- (ii) State the addition law of probabilities for not mutually exclusive events.
- (iii) A fair die is thrown. Find the probabilities that the face on the die is:
  - (a) maximum
  - (b) prime
  - (c) multiple of 3
- (iv) In a pizza restaurant, 95% of the customers order pizza. If 65% of the customers order pizza and a salad, find the probability that a customer who orders pizza will also order a salad.
- (v) A random variable  $X$  has the following probability distributing.
 

$x$	-2	-1	0	1	2	3
$P(x)$	0.1	$k$	0.2	$2k$	0.3	$3k$

 Determine (a)  $k$  (b)  $P(-2 < X < 2)$  (c)  $P(X \leq 1)$
- (vi) Given  $E(X^2) = 200$  and  $SD(X) = 12$ . Find  $E(X)$ .
- (vii) Find the mean of binomial distribution  $(q + p)^3$ .
- (viii) In a binomial distribution with  $n = 5$ , what is the value of other parameter of the binomial if  $P(X = 0) = P(X = 1)$ . Find its variance.
- (ix) In a normal distribution, the mean and standard deviation are 0 and 1 respectively. Write down its equation and find the value of the maximum ordinate correct to four decimal places.
- (x) Write down any six properties of normal distribution.
- (xi) In normal distribution  $\mu = 100$  and  $\sigma = 10$ . Find  $Q_1, Q_3$  and the values of points of inflection.
- (xii) What is the value of finite population correction factor (f.p.c) when  $n = 18$  and  $N = 125$
- (xiii) Differentiate between parameter and statistic.
- (xiv) A population consists of values 0 and 4. Draw all possible samples of size 3 with replacement.
- (xv) Given  $\bar{X} = 140, s = 8, n = 20$ , and  $t_{0.01(19)} = 2.539$ . Construct the 98% confidence interval for population mean  $\mu$ .
- (xvi) Given  $n_1 = 100, \bar{X}_1 = 345, n_2 = 100, \bar{X}_2 = 340, \sigma_1^2 = 196, \sigma_2^2 = 204$  and  $Z_{0.005} = 2.58$ . Find 99% confidence interval for the difference between population means  $\mu_1 - \mu_2$ .
- (xvii) Given  $\bar{x} = 43260, H_0: \mu \leq 42000, H_1: \mu > 42000, \sigma = 5230, \alpha = 0.05$  and  $n = 30$ . Find  $Z$  and make the statistical decision.
- (xviii) Given the following information  $N = 1000, (A) = 946, (B) = 490, (AB) = 452$ . Show that attributes  $A$  and  $B$  are negatively associated.
- (xix) Name various input and output devices.

### SECTION - C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. (2 x 13 = 26)

- Q. 3 a. A roulette wheel has 38 spaces numbered 1 through 36, 0 and 00. Find the probability of getting following results:
  - (i) An odd number
  - (ii) A number greater than 25
  - (iii) A number less than 15 not counting 0 and 00. (04)
- b. Draw all possible samples of two letters each, with replacement from the letters of word "PEN"
  - (i) Find proportion of letter "E" in each sample.
  - (ii) Make sampling distribution of proportions obtained in part (i)
  - (iii) Find mean and variance of the distribution.
  - (iv) Verify that (a)  $\mu_{\hat{p}} = p$  (b)  $\sigma_{\hat{p}}^2 = \frac{pq}{n}$  (09)
- Q. 4 a. In a normal distribution with  $\mu = 120$  and  $\sigma = 8$ , find two points such that a single observation has 60% chance for falling between them. (04)
- b. Samples of two types of electric light bulbs were tested for length of life and the following data were recorded:
  - Type I:  $n_1 = 5, \bar{x} = 1224 \text{ hrs}, \Sigma(x - \bar{x})^2 = 6484$
  - Type II:  $n_2 = 7, \bar{y} = 1036 \text{ hrs}, \Sigma(y - \bar{y})^2 = 11200$
 Is the difference in the means significant? Assume that the population of two types has the same variance. Use  $\alpha = 0.05$  (09)
- Q. 5 a. The IQ's of the college students are known to be normally distributed with a mean of 123. A random sample of 49 students showed an average IQ of  $\bar{x} = 120.67$  and  $S = 8.44$ . Test the hypothesis that  $\mu \geq 123$  against the alternative that it is less. Let  $\alpha = 0.05$ . (05)
- b. The following data show the relation between the performances of students in computer sciences and management sciences. Test the hypothesis that there is association between the performance in computer sciences and the performance in management sciences students grade using  $\alpha = 0.05$ . (08)

Grade in Computer Sciences	Grade in Management Sciences		
	High	Medium	Low
High	56	96	28
Medium	48	168	24
Low	16	86	78