STATISTICS HSSC–II
SECTION – A (Marks 17)

Time allowed: 25 Minutes

Version Number | 4 | 1 | 3 | 1

Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which 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 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) If $P(A/B) = P(A)$ and $P(B/A) = P(B)$, then events A and B are called:
   - A. Not-Mutually exclusive events
   - B. Independent events
   - C. Dependent events
   - D. Equally likely events

2) A person can choose a tie and a suit from 3 suits and 5 ties in:
   - A. 8 ways
   - B. 15 ways
   - C. 30 ways
   - D. 3 ways

3) If X and Y are independent variables, it is given that $V(x) = 3$ and $V(y) = 5$, then $V(x - y) = :$
   - A. −2
   - B. 2
   - C. 8
   - D. 34

4) In a hyper geometric experiment the successive trials are:
   - A. Independent
   - B. Dependent
   - C. Infinite
   - D. Exhaustive

5) In a binomial distribution, if $q = p = 1/2$ then distribution is said to be:
   - A. Skewed
   - B. Non-Normal
   - C. Symmetrical
   - D. Asymmetrical

6) In normal curve, the interval $\mu \pm 3\sigma$ includes:
   - A. 50% area
   - B. 68.27 % area
   - C. 95.45% area
   - D. 99.73 % area

7) The points of inflection of the normal curve with mean μ and standard deviation σ lie at:
   - A. $\mu \pm \sigma$
   - B. $\mu \pm 2\sigma$
   - C. $\mu \pm 3\sigma$
   - D. $\mu \pm 0.6745\sigma$

8) The sampling error can be reduced by:
   - A. Increasing the sample size
   - B. Decreasing the sample size
   - C. Training of investigators
   - D. Follow up the non-responses

9) A complete list of all the sampling units in a sample survey is called:
   - A. Sampling frame
   - B. Sample design
   - C. Sampled population
   - D. Target population

10) For contingency table, if total degree of freedom is 12 and number of rows are 4, then number of columns will be:
    - A. 5
    - B. 4
    - C. 3
    - D. 6

11) If observed and expected frequencies are identical then the value of chi square statistic would be:
    - A. 1
    - B. Zero
    - C. Greater than zero
    - D. Less than zero

12) A numerical value calculated from a sample is called:
    - A. Parameter
    - B. Statistic
    - C. Mean
    - D. Proportion

13) A single numerical value is obtained as an estimate of the parameter in case of:
    - A. Interval estimation
    - B. Point estimation
    - C. Testing hypothesis
    - D. Statistical inference

14) A misfit person is selected for the job is:
    - A. Not an error
    - B. Type I-error
    - C. Type II-error
    - D. Sampling error

15) Which of the following **CANNOT** be Null hypothesis H_o :
    - A. $\theta \leq \theta_0$
    - B. $\theta \geq \theta_0$
    - C. $\theta = \theta_0$
    - D. $\theta \neq \theta_0$

16) $\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}$ is a standard error of statistic:
    - A. $\hat{P}_1 - \hat{P}_2$
    - B. $\mu_1 - \mu_2$
    - C. $\overline{X}_1 - \overline{X}_2$
    - D. $\overline{X}$

17) DVD stands for:
    - A. Digital video display
    - B. Digital VCR disk
    - C. Digital video disk
    - D. Double versatile disk

STATISTICS HSSC–II

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)   Differentiate between mutually and not-mutually exclusive events.

(ii)   For any two events A and B, it is given that $P(A) = 8/12$, $P(A \cup B) = 7/12$ and $P(A \cap B) = 5/12$ find $P(B)$ and $P(B/A)$.

(iii)   Write down any three properties of mathematical expectation.

(iv)   Find the mean and variance of $Y = 2X + 5$, if $E(X) = 1$ and $E(X^2) = 6$

(v)   Write down the properties of a hyper geometric experiment.

(vi)   If $X \sim b\,(10, 0.4)$ then find mean and variance of $Y = (X - 10)/6$.

(vii)   In a binomial distribution, the mean and S.D are 36 and 4.8 respectively. Find its parameters.

(viii) Given that $N = 10$, $n = 4$, $K = 3$. Find mean and variance of hyper geometric distribution.

(ix)   The Mean deviation of Normal distribution is 16. Find the approximate value of its S.D.

(x)   In a normal distribution, $\mu = 20$, $\sigma = 5$, find Q_1, Q_3 and Q.D.

(xi)   Differentiate between parameter and statistic.

(xii)   Given $n_1 = 2$, $n_2 = 4$, $\mu_1 = 20$, $\mu_2 = 5$, $\sigma_1^2 = 4$, $\sigma_2^2 = 12$. Find mean and variance of sampling distribution of $\overline{X}_1 - \overline{X}_2$ when sampling is done with replacement.

(xiii) If $N = 300$, $n = 10$, $\sigma_{\overline{x}}^2 = 3.5$. Find population variance when sampling is done without replacement.

(xiv)   Define Estimate, Estimator and Estimation.

(xv)   Find 90% confidence interval for population mean of a normal population with $\sigma = 3$ and given sample values are 2, 4, 6, 8, 10 $(Z_{.05} = 1.645)$

(xvi)   Differentiate between Type-I and Type –II error.

(xvii) If $H_o : P_1 - P_2 = 0$ vs $H_1 : P_1 - P_2 \neq 0$ $n_1 = 900$, $n_2 = 1000$, $\hat{p}_1 = 0.80$, $\hat{p}_2 = 0.75$ then find the combined proportion $\hat{p}_c$ and the value of test statistic Z.

(xviii) Given $N = 800$, $(A) = 300$, $(AB) = 270$, $(\beta) = 100$. Calculate coefficient of association.

(xix)   Differentiate between low level language and high level language.

SECTION – C (Marks 26)

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

Q. 3   a. In a consignment of bolts, 25% of the bolts are rusted and 30% are defective. Find the probability that a bolt selected at random is rusted or defective.   **(03)**

b. A random variable has the following probability distribution: **(1+1+3)**

X	0	1	2	3	4
P(X)	0.1	0.2	0.3	0.35	0.05

Find

(i)   E(x)   (ii)   var(x)   (iii)   show that E(5x+8)=5E(x)+8

c. A bag contains 3 white and 2 black balls. If three balls are drawn at random and X shows the number of black balls in the sample, then find the probability distribution of X.   **(05)**

Q. 4 **a.** If 10% of the toys are produced by a machine are defective. Find the probability that out of

4 toys chosen at random: **(04)**

    (i)   2 toys are defective

    (ii)   At least 3 toys are defective

b. If the heights of the 1000 soldiers in a regiment are normally distributed with a mean of 172 cm and

S.D of 5 cm. How many soldiers have heights greater than 183 cm? **(03)**

c. Draw all possible samples of size 2 with replacement from the population 3, 5, 7, 9. Construct

sampling distribution of sample mean and verify the results. **(06)**

    (i) $\mu_{\bar{x}} = \mu$ (ii) $\sigma_{\bar{x}}^2 = \dfrac{\sigma^2}{n}$

Q. 5 **a.** Test the association between general ability and mathematical ability by calculating chi-square

statistic **(07)**

General ability	Mathematical ability		
	Good	Fair	Poor
Good	88	44	8
Fair	530	514	356
Poor	82	812	196

(Tabulated value is $X^2_{0.05(4)} = 9.488$)

b. A test of breaking strength of 6 ropes manufactured by a company showed a mean breaking strength

of $\bar{X} = 7800 N$ and standard deviation of $s = 150\,N$, whereas manufacturer claimed a mean breaking

strength of $8000\,N$. Can we support the manufacturer's claim at 5% level of significance? **(06)**