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Version No.				
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ROLL NUMBER						

STATISTICS HSSC–II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Answer Sheet No. _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پُر کریں۔ **Invigilator Sign.** _____

Fill the relevant bubble against each question according to curriculum: **Candidate Sign.** _____

	Question	A	B	C	D	A	B	C	D
1.	In how many ways can four books be arranged on a shelf?	4	6	24	12	○	○	○	○
2.	A student prepares for an examination paper subject to his personal beliefs, guess or confidence. His approach to probability is:	Mathematical	Statistical	Axiomatic	Personal or subjective	○	○	○	○
3.	If $P(A \cup B) = P(A) + P(B)$, then A and B are:	Mutually exclusive	Independent	Non-Mutually exclusive	Equally likely	○	○	○	○
4.	The expected value of a random variable is equal to its:	Median	Variance	Mean	Mode	○	○	○	○
5.	If X is a continuous random variable and $f(x)$ is its pdf then $P(X = 24)$ is:	1	0	>0	<0	○	○	○	○
6.	The mean of a binomial distribution depends on:	Probability of success only	Probability of failure	Number of trials only	Probability of success and number of trials	○	○	○	○
7.	In which distribution does the probability of success change from trial to trial?	Binomial distribution	Sampling distribution	Hypergeometric distribution	Continuous distribution	○	○	○	○
8.	In a $N(\mu, \sigma^2)$, β_2 is equal to:	$3\sigma^4$	3	$\frac{\sigma^4}{2}$	$\frac{3\sigma^4}{4}$	○	○	○	○
9.	The range of the normal distribution is:	0 to $+\infty$	$-\infty$ to 0	$-\infty$ to $+\infty$	0 to n	○	○	○	○
10.	Suppose that for a certain population $\sigma_{\bar{x}} = 20$ when sample of size 25 is taken. What must be the value of σ?	100	50	10	4	○	○	○	○
11.	A population contains two items. Four items are selected at random with replacement, then all possible samples shall be:	16	8	$\binom{4}{2}$	4	○	○	○	○
12.	If the observations are paired and the number of pairs is n, then the number of degrees of freedom is equal to:	n	n-1	2n	2n-1	○	○	○	○
13.	A judge acquits a guilty person. It is an example of:	Type I error	Type II error	Correct decision	Confidence level	○	○	○	○
14.	The critical region is decided to keep in view the:	Null hypothesis	Alternative hypothesis	Test statistics	Composite hypothesis	○	○	○	○
15.	When the expected frequencies are too small, the value of Chi-square will be:	Overestimated	Underestimated	Unaffected	Biased estimated	○	○	○	○
16.	For a contingency table d.f=12 and the No. of columns = 5 then the No. of rows will be:	5	4	3	6	○	○	○	○
17.	Mouse is an example of:	Input device	Output device	CPU	Compiler	○	○	○	○

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STATISTICS HSSC–II

Time allowed: 2:35 Hours **Total Marks Sections B and C: 68**

SECTION – B (Marks 42)

Q. 7 Write brief answers of any FOURTEEN parts **(14 x 3 = 42)**

(i) Distinguish between permutations and combinations.

(ii) If A and B are independent events with $P(A)=0.2$ and $P(B)=0.6$. Find $P(A\cup B)$.

(iii) In a given population 470 male births are registered in 1000 births. What is the probability of the next female birth?

(iv) Given $E(X)=0.55$, $\text{var}(X)=1.55$, and $Y=2X+1$. Find $E(Y)$ and $\text{var}(Y)$.

(v) Describe the properties of a discrete probability distribution.

(vi) A random variable X is binomially distributed with mean 3 and variance 2. Compute $P(X=6)$.

(vii) In a binomial distribution with $n=5$, $P(X=0)=P(X=1)$. Find the variance.

(viii) 1st and 3rd quartiles of the normal distribution are 9 and 18, respectively. Find the mean and standard deviation of the distribution.

(ix) The value of the second moment about the mean in a normal distribution is 5. Find the third and fourth moments about the mean for this distribution.

(x) Differentiate between probability and non-probability sampling.

(xi) Given N=310, n=100, $\sigma_{\bar{x}}^2=35$. Find σ^2 when sampling is done without replacement.

(xii) Find population mean and variance if samples of size 2 with replacement give mean and variance as 10 and 2.5, respectively.

(xiii) What is an unbiased estimator?

(xiv) Given $\overline{X}=120$, $\mu_0=100$, $n=25$, and $S=34.75$. Find the value of t.

(xv) What is meant by a contingency table?

(xvi) Given the following information $(\alpha)=54$, $(\alpha\beta)=16$, $(B)=490$, $N=1000$. Show whether attributes A and B are positively associated, negatively associated, or independent.

(xvii) Given $\overline{X}=42.7$, $\sigma=8$, $n=64$, and $Z_{\frac{\alpha}{2}}=1.645$. Find the confidence interval for μ.

(xviii) Distinguish between simple and composite hypotheses.

(xix) Differentiate between RAM and ROM.

SECTION – C (Marks 26)

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

Q. 3 **a.** The probability that Mr. A will pass the examination is $\frac{2}{3}$ and that Mr. B will pass is $\frac{3}{4}$. Find the probabilities that **(i)** both will pass the examination, **(ii)** at least one will pass the examination, and **(iii)** somebody will pass the examination. **(06)**

b. Three coins are tossed. If X denotes the number of heads, then find the probability distribution of X. Calculate the mean, variance, and graph of the probability distribution. **(07)**

Q. 4 **a.** In a normal distribution, $\mu = 300$ and $\sigma^2 = 100$. Find **(i)** the area above 314, **(ii)** the two values that contain the middle 75% area, and **(iii)** Q1 and Q3. **(05)**

b. A population has seven values 2, 3, 4, 5, 7, 8, 10. Draw all possible samples of size 2 without replacement. Find the mean of each sample. Construct the sampling distribution sample of means and verify that: (i) $\mu_{\bar{x}} = \mu$ (ii) $\sigma_{\bar{x}}^2 = \frac{\sigma^2}{n}\left(\frac{N-n}{N-1}\right)$ **(08)**

Q. 5 **a.** 150 brand A light bulbs showed a mean lifetime of 1400 hours with a standard deviation of 120 hours. A sample of 200 brand B light bulbs showed a mean lifetime of 1200 hours with a standard deviation of 80 hours. Find (i) 95% and (ii) 99% confidence limits for the difference of the mean lifetimes of populations of brands A and B. $(Z_{0.025} = 1.96\ Z_{0.001} = 2.58)$ **(05)**

b. The following table shows the likings of three colors pink, white, and blue in a sample of 200 males and females. Test whether there is any relation between gender and color at a 5% level of significance $\left(\chi^2_{0.05(2)} = 5.99\right)$. **(08)**

Clours	Gender		
	Male	Female	Total
Pink	20	40	60
White	40	20	60
Blue	60	20	80
Total	120	80	200