UCSC

University of Colombo, Sri Lanka

University of Colombo School of Computing

BACHELOR OF SCIENCE IN INFORMATION SYSTEMS

First Year Examination - Semester II - UCSC AY20 [held in March/April 2024]

IS 1112 — Probability and Statistics

(Two (2) Hours)

123

Answer ALL questions

Number of Pages = 11 Number of Questions = 04

To be completed by the candidate								
Index Number:								

Important Instructions to candidates:

I. Students should answer in the medium of English language only using the space provided in this question paper.

II. Note that questions appear on both sides of the paper. If a page or a part of this question paper is not printed, please inform the supervisor immediately.

III. Write your index number CLEARLY on each and every page of this Question paper.

IV. This paper consists of 04 questions in 11 pages (including the Cover Page).

V. Answer ALL questions.

VI. Programmable Calculators and any electronic device capable of storing and retrieving text including electronic dictionaries, smart watches and mobile phones are not allowed.

VII. Non-Programmable calculators are allowed

VIII. Do not tear off any part of this answer book. Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate

To be completed by the examiners

1	
2	
3	
4	
Total	

Question Number 01.

This question consists of 15 multiple choice questions. Select the most suitable answer and encircle the correct choice in the following table. [25 Marks]

Question Number	Answers					Question Number	Answers					Question Number	Answers				
i	a	b	c	d	e	vi	a	b	c	d	e	xi	a	b	c	d	e
ii	a	b	c	d	e	vii	a	b	c	d	e	xii	a	b	c	d	e
iii	a	b	c	d	e	viii	a	b	c	d	e	xiii	a	b	c	d	e
iv	a	b	c	d	e	ix	a	b	c	d	e	xiv	a	b	c	d	e
v	a	b	c	d	e	x	a	b	c	d	e	xv	a	b	c	d	e

i). Which one of the following cannot be used when you want to visually examine the relationship between two qualitative variables?

a. Bar graph
b. Pie chart
c. Line chart
d. Scatter diagram
e. Time plot

ii). Which one of the following is often the preferred measure of central tendency if the data are severely skewed?

a. Mean
b. Median
c. Mode
d. Range
e. First quartile

iii). Which of the following is an example of a continuous random variable?

a. The number of SMS received to your mobile phone in a particular day.
b. The megabytes of a 500GB hard disk.
c. The number of men taller than 180cm in a group of 60 men.
d. The GPA value of second year students in the UCSC.
e. The total area of the screen size of a 15.4' LCD screen.

iv). Which one of the following is a measure of variability?

a. Second quartile
b. Mean
c. Minimum
d. Percentile
e. Inter-Quartile range

v). If a test was very easy, except for a few students who had very low scores, then the shape of the distribution of scores would be:

a. Positively skewed
b. Negatively skewed
c. Normal
d. Not skewed at all
e. Symmetric

vi). Methods of making decision about the population using the sample data is called,

a. Theoretical statistics
b. Analytical statistics
c. Descriptive statistics
d. Inferential statistics
e. Graphical statistics

vii). Data that were collected by someone else for some other purpose are called,

a. Primary data
b. Secondary data
c. Random data
d. Specific data
e. Purposive data

viii). A method measuring some variables by controlling other variables is called,

a. Survey
b. Census
c. Observations study
d. Experiment
e. Group study

ix). Which of the following quantities in standard notations, would give us information about a sample?

a. μ c. σ e. $\overline{X}$
b. π d. σ^2

x). Which of the following statements is **TRUE** about the standard deviation?

a. Standard deviation has no unit of measurement.
b. Standard deviation is either positive or negative.
c. Standard deviation is influenced by outliers.
d. Standard deviation is used even when the mean is not an appropriate measure of center.
e. Standard deviation can be zero.

xi). If A and B are mutually exclusive events, then,

a. $P(A \cup B) = P(A) + P(B)$ d. $P(A \cup B) = P(A) - P(B)$
b. $P(A \cup B) = P(A) \times P(B)$ e. $P(A \cap B) = P(A) + P(B)$
c. $P(A \cap B) = P(A) \times P(B)$

xii). The variance of a binomial distribution with n= 8 and mean = 0.8 is,

a. 0.08 c. 0.64 e. 1.28
b. 0.10 d. 0.72

(check answer???)

xiii). If $B \subset A$ then $P(A|B)$ is equals to,

a. 0 c. 0.5 e. $P(B)$
b. 1 d. $P(A)$

xiv). Let A, B and C be three events. Which of the following represents the event that only A and B occurs?

a. $A \cap B$ c. $A \cap B \cap C^c$ e. $A \cap B \cup C$
b. $A \cup B$ d. $A \cup B \cup C^c$

xv). Suppose that the heights of first year university students have symmetrical bell shaped distribution with the mean 160cm and the variance 16. Using the empirical rule in statistics, approximately what percentage of heights falls between 152 and 156?

a. 2.5% c. 34% e. 50%
b. 13.5% d. 47.5%

Question Number 02

a) If two events A and B are such that $P(A) = 0.5$, $P(\bar{B}) = 0.4$ and $P(A \cap B) = 0.3$.

i. Calculate $P(A|B)$. **[05 Marks]**

ii. Are the events A and B mutually exclusive? Give a reason for your answer. **[05 Marks]**

iii. Are the events A and B independent? Justify your answer. **[05 Marks]**

b) A certain telecommunication service provider received 1,000 telephone calls to their customer care center and it is found that the lengths of these calls are normally distributed, with mean 240 seconds and standard deviation 40 seconds.

i. What is the probability that a length of a call is between 110 and 300 seconds? **[05 Marks]**

ii. Between what two values will the middle 95% of the call lengths fall? **[05 Marks]**

Question Number 03

a) The probability of a sales girl making a sale on a customer over the phone is 0.1.

i. Calculate the probability that no sales are made in 10 calls. **[05 Marks]**

ii. Calculate the probability that more than 3 sales are made in 20 calls. **[05 Marks]**

iii. Company is expecting a mean of five sales per day. How many calls need to be made to achieve this requirement? **[05 Marks]**

b) In a bank, system breakdowns occur randomly at a rate of 3 per year.

i. Calculate the probability that in any given year there will be exactly 6 power cuts. **[05 Marks]**

ii. Calculate the probability that in any given year at least 3 power cuts. **[05 Marks]**

Question Number 04

a) Let the random variable X has the probability mass function as follows. Determine the value of k. **[05 Marks]**

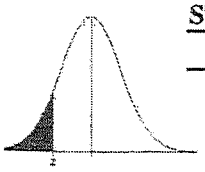
$$P[X = x] = \begin{cases} k\ {}^{4}C_{x} & for\ x = 0,1,2,3,4 \\ 0 & otherwise \end{cases}$$

b) It is observed that 10% of mails are spam. There is a software that filters spam mail before reaching the inbox. Its accuracy for detecting a spam mail is 99% and chances of tagging a non-spam mail as spam mail is 5%. If a certain mail is tagged as spam find the probability that it is not a spam mail. **[10 Marks]**

c) Three companies A, B and C supply 25%, 35% and 40% of the notebooks to a school. Past experience shows that 5%, 4% and 2% of the notebooks produced by these companies are defective. If a notebook was found to be defective, what is the probability that the notebook was supplied by company A?

[10 Marks]

---------- End of the question Paper ----------



STANDARD NORMAL DISTRIBUTION:

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-3.9	.00005	.00005	.00004	.00004	.00004	.00004	.00004	.00004	.00003	.00003
-3.8	.00007	.00007	.00007	.00006	.00006	.00006	.00006	.00005	.00005	.00005
-3.7	.00011	.00010	.00010	.00010	.00009	.00009	.00008	.00008	.00008	.00008
-3.6	.00016	.00015	.00015	.00014	.00014	.00013	.00013	.00012	.00012	.00011
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-3.2	.00069	.00066	.00064	.00062	.00060	.00058	.00056	.00054	.00052	.00050
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-0.5	.30854	.30503	.30153	.29806	.29460	.29116	.28774	.28434	.28096	.27760
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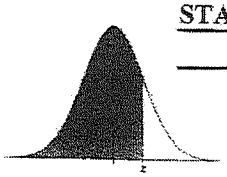

STANDARD NORMAL DISTRIBUTION:

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3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997