





University of Colombo, Sri Lanka

University of Colombo School of Computing

## BACHELOR OF SCIENCE IN COMPUTER SCIENCE

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

SCS2211 — Laboratory II

(Two (2) Hours)

Answer ALL questions

Number of Pages = 15

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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 4 questions on 15 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

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(b) Write a fund	ction in R n	amed as " F	rime_nu	mbers(	) " to find the	prime numb
up to a give	n number 'n	n'.	<del></del>			
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(d) Explain how you can find the least squares regression line using below. Also explain how to predict an approximate value for an un least squares regression line. You can use a suitable example to explain your thinking.	the equations given seen event, using the
$m = \frac{N \Sigma(xy) - \Sigma x \Sigma y}{N \Sigma(x^2) - (\Sigma x)^2}$	
$b = \frac{\Sigma y - m \Sigma x}{N}$	
	[06 Marks]
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(e) Outline how the inbuilt help facility in R could be used.	
(-) no in and mount hosp mounty in it could be used.	
	[01 Mark]
	Approximate and the state of th


## Question 2

(a) All the employees of "ABC Company" have taken a skill assessment provided by a certain website. The twelve (12) employees of the company scored the following marks for the skills assessment.

Table Name: Skill Assessment Table

#	Name	Age	Marks
1	Alice	28	88
2	Bob	21	72
3	Charlie	32	90
4	David	24	81
5	Eva	23	78
6	Frank	28	88
7	Grace	31	90
8	Hank	15	48
9	lvy	21	75
10	Jack	23	80
11	Ken	18	64
12	Liam	35	94

(i) Write the R code for creating a vector named "marks" to store the values given in the "Marks" column of the skill assessment table.

		[01 Mark]
	******************************	
	(ii)	Write the R code for calculating the sum, mean and median of "marks" vector
		[03 Marks]
and Specifical		

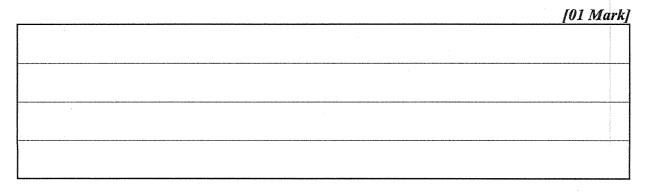
Mathematically compute the variance $(\sigma^2)$ and standard de "marks" to the nearest 3 decimal places.	eviation (
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Index No:	•••••
(b) It was noticed that there is a linear correlation between <i>Age</i> and <i>Marks</i> obtained employees in "ABC Company".	by the
(i) Find the <b>explanatory variable</b> and <b>response variable</b> using the skill asset table given above such that there is a correlation between these two variables	ssmen 3.
[02 X	Marks
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	<del>1-1-1-1</del> -1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-
<ul> <li>(ii) Find the correlation coefficient r, using appropriate variables and the data proint the skill assessment table above.</li> <li>Use the following equation to find the correlation coefficient r.</li> </ul>	ovideo
$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{\left[n\sum x^2 - (\sum x)^2\right]\left[n\sum y^2 - (\sum y)^2\right]}}$	
[10 ]	Marks
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	b)-1-(4-11/4-1

Ind	lex No:
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(iii) Interpret the relationship of correlation between	the two variables.  [01 Mark]
	·
Question 3	
(a) Briefly explain three (03) features of GNU Octave.	
(a) Diffing explain times (03) reactions of One Courts.	
	[06 Marks]

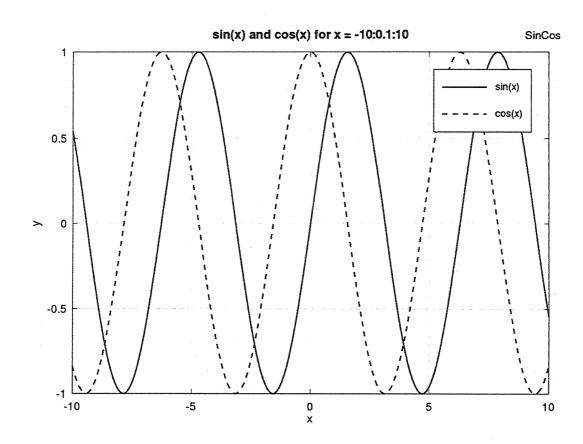
	Index No:
MARKET	
(b) What	t are scripts in Octave and how can they be used in both Octave and MATL
·	[04 Ma
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(c) Write	e the outputs of the Octave code fragments given below.
(i)	>> a = linspace (0,15,5)
	[01 M
<b>4.</b>	
	>> floor (5.6)
	[01 M
(iii)	>> s = ["Heal" 'The' "World"]; >> disp(s)
	[01 M

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	[01 Mark]
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ı	

(d) Fill in the blanks in the following octave script to plot y = sin(x) and y = cos(x) lines in the same graph, such that the final output will be as follows.



10 of 15

[10 Marks]

```
% Octave script for y = \sin(x) and y = \cos(x)
x = ______ : 0.1 : 10 ;
y_sin = _____;
% Plot sin(x) and hold the plot
 _____ (x, y_sin, 'k', 'LineWidth', 1); % 'k' for black
y_cos = ____;
% Plot cos(x)
plot(x, y_cos, ' _____ ', 'LineWidth', 1);
% 'k--' for black dashed line
     ____ ("sin(x) and cos(x) for x = -10:0.1:10");
xlabel("x");
ylabel("y");
text(9, 1.1, " _____ ");
 _____ ("sin(x)", "cos(x)");
 ; % Add gridlines
% Release the hold
hold off;
% End of the code
```

(a)	Explain how you can scale your plots using <b>semilogx</b> , <b>semilogy</b> and <b>loglog</b> a suitable diagram for each plot.	plots us	n
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(b) **Newton Raphson Numerical Method** is a powerful technique for solving equations numerically. It is most commonly used for approximation of the roots of the real-valued functions. The general equation for the Newton Raphson method is as follows.

$$x_{n+1} = x_n - rac{f(x_n)}{f'(x_n)}$$

(i) It is given that  $x^3 - 3 = 0$  has a root between 1 and 3. Explain how you can find the approximate root value to 3 decimal places using **Newton-Raphson numerical method** by assuming the initial value as 2. Use the above equation and clearly show your calculations.

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(ii)	Explain how you can use GNU Octave to effectively obtain a for the root by writing a suitable Octave code segment for Numerical Method.	an accurate va Newton Raphs
		[06 Mar

Index No:	•••••
Suppose that you have a PNG image named as 'rose.png' in your current w directory.	orking
(i) Write the Octave code to read the image and store the image detain variable named "Image".	ils in a
<b>[02</b> ]	Marks]
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
(ii) Suppose you need several information about the image such as File FileModDate, FileSize etc. Write the Octave code to get this information displayed in the command window.	ename,
[02 A	Marks]
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(iii) Write the Octave code to visualize the image named 'rose.jpg'.	
[01	Mark]
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