



ZIMBABWE EZEKIEL GUTI UNIVERSITY
FACULTY OF HEALTH, SCIENCE AND TECHNOLOGY

DEPARTMENT OF DIGITAL TECHNOLOGY

EXAMINATION PAPER

COURSE CODE : CDT 105
COURSE TITLE : Design and Analysis of Algorithms
SPECIAL REQUIREMENTS : None
DURATION : 3 Hours
LEVEL : 1.2
DATE : November 2019

11 NOV 2019

INSTRUCTIONS TO CANDIDATES:

1. Answer **ALL** Questions in Section A.
2. Answer any **TWO** Questions from Section B.
3. The algorithms should be done using pseudo code.
4. The marks allocation for each question is indicated in **BOLD** font.

Section A: Answer ALL questions [50 Marks]

QUESTION 1

- a) Explain the following as being used in design and analysis of algorithms
- i. Algorithm [2marks]
 - ii. Time complexity [4 marks]
 - iii. Space complexity [4 marks]
 - iv. Worst case analysis [5 marks]
 - v. Best case analysis [5 marks]
 - vi. Average case analysis [5 marks]

QUESTION 2

- a) As someone involved in algorithmic, recommend the use of analysis of algorithms
[9 marks]
- b) Describe the three parts that are involved in divide-and-conquer algorithms
[6 marks]
- c) Explain the pros and cons of Divide and Conquer Approach [6 marks]
- d) Suggest and explain some problems, which are solved using divide and conquer approach.
[4 Marks]

Section B: Answer ANY TWO Questions in this section. All Algorithms to be written in Pseudo Code [50 Marks]

Question 3

Design a flowchart for a program that does the following:

Accepts a person's height and weight and calculates their BMI (Body-Mass-Index). If the BMI is less than 18.5, display the message "You are underweight", else if it is between 18.5 and 25, display the message "Your weight is normal", else if it is more than 25 but less than or equal to 30, display the message "You are overweight" and else

if it is above 30, display the message “You are obese”. BMI is calculated as w/h^2 where h =height in metres and w =weight in kilograms. [25 Marks]

Question 4

Use the 0-1 knapsack problem (both greedy and dynamic approaches) to determine the optimal amount the thief will carry

Knapsack of capacity $W = 5$

<u>Item</u>	<u>weight</u>	<u>value</u>
1	2	\$12
2	1	\$10
3	3	\$20
4	2	\$15

[25 Marks]

Question 5

The Floyd algorithm is regarded as a dynamic programming. Illustrate the algorithm on the following description.

Samanyika, a level 1.2 student doing Digital Technology program is staying at ZEGU campus. He has been tasked by the University’s director of ICT to determine the shortest distances that can be applied on the campus wide computer network linking various buildings as follows:

Bindura Hall to Computer Lab	115m
Library to Bindura Hall	65m
Computer Lab to the Security Office (at gate)	45m
Bindura Hall to Security Office (at gate)	123m
Security Office (at gate) to Library	99m
Library to Computer Lab	27m

[25 Marks]

*******End of Paper*******