BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF EDUCATIONAL TECHNOLOGY

BACHELOR OF SCIENCE EDUCATION IN COMPUTER SCIENCE

CS213 /EDT213: DATA STRUCTURES AND ALGORITHMS

TIME: 3 HOUR

AUG 2024

INSTRUCTIONS

Answer **ALL the questions.** Each question carries **20** marks.

The question paper has **5** questions

Question 1

i. Define the following terms as used in Data structures and algorithm analysis

- **a.** Abstract Data Type **[2]**
- b. Data Abstraction **[2]**
- **c.** Non Primitive data structure **[2]**
- **d.** Storage Structure **[2]**
- e. A dangling reference **[2]**

ii. Write and algorithm for push implementation of stack using one dimensional arrays **[10]**

Question 2

i. What do you understand by best, worst and average case analysis of an algorithm? **[6]**

ii. With the aid of diagrams and C++ code , explain any two of the four operations in singly linked lists **[14]**

Question 3

i. Draw an expression tree for (a+b*c) + ((d*e+f*g) **[5]**

ii. Briefly describe any five operation of queues **[5]**

iii. Write a C++ code for the search function in a binary tree **[10]**

Question 4

i. Make three comparisons of an array based stack and a linked stacks [9]

ii. Find the asymptotic solution of the following recurrence

$$T(n) = \log n + T(\sqrt{n})$$

Express your answer in the using the big -Theta Θ notation and give a brief explanation [7]

iii. Give two ways in which recursion and stacks are related? [4]

Question 5

i. Suppose a certain flight **XXX** is fully booked an hour prior to departure.
Because of the possibility of cancellations,
   a. Which data structure would you suggest for the airline to maintain of standby passengers hoping to get a seat? [4]
   b. Explain your choice [8]
   c. Explain how a standby person can be let to board the plane give your answer in a) [8]

END OF EXAMINATION