REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARD

FOR

COMPUTER SCIENCE TECHNICIAN

KNQF LEVEL 6

(CYCLE 3)

PROGRAMME ISCED CODE: 0613 554 A.

TVET CDACC
P.O. BOX 15745-00100
NAIROBI

CREATE ALGORITHMS AND DATA STRUCTURES

ISCED UNIT CODE: 0613 554 09A

UNIT CODE: ICT/OS/CS/CR/09/6/MA

UNIT DESCRIPTION

This unit covers the competencies required to understand algorithms and data structure. It involves Understand fundamental principles of algorithms understanding fundamental concepts of data structures, linked lists, stacks and queues, search techniques and sorting techniques

ELEMENT These describe the **key outcomes** which make up **workplace function**.	**PERFORMANCE CRITERIA** These are **assessable** statements which specify the required level of performance for each of the elements. ***(Bold and italicized terms are elaborated in the range.)***
1. Applied fundamental principles of algorithms	1.1 Algorithms principles are identified 1.2 Algorithms characters are applied 1.3 Algorithm are written 1.4 Algorithm are Analysed 1.5 ***Complexities*** of algorithms are computed 1.6 ***Greedy algorithms*** are applied 1.7 Divide and conquer is applied
2. Apply fundamental concepts of data structures	2.1 ***Key concepts in data structures*** are applied 2.2 Arrays are created 2.3 Array insertion operations are performed 2.4 Array delete, search and update are performed 2.5 Array operations are performed
3. Utilize Linked lists	3.1 Linked lists are created 3.2 Doubly linked lists are created. 3.3 Circular linked lists are created 3.4 ***Basic operations for the various linked lists*** are applied
4. Create Stacks and Queues	4.1 Stacks and queues are applied 4.2 Stack and queue created 4.3 ***Basic operations in stacks*** are performed 4.4 ***Basic operations in Queue*** are performed 4.5 Basic operations in stacks and queue are applied
5. Utilize Search Techniques	5.1 Search is performed 5.2 Linear Search is performed 5.3 Binary Search is performed 5.4 Search techniques are applied

ELEMENT These describe the **key outcomes** which make up **workplace function**.	**PERFORMANCE CRITERIA** These are **assessable** statements which specify the required level of performance for each of the elements. ***(Bold and italicized terms are elaborated in the range.)***
6. Apply Sorting Techniques	6.1 Sorting is defined 6.2 ***Categories of sorting techniques*** are applied 6.3 ***Types of Sorting algorithms*** are applied 6.4 Sorting algorithms are demonstrated using C++

RANGE

This section provides work conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	**Range**
8. Complexities may include but is not limited to:	● Space ● Time
9. Greedy algorithms may include but is not limited to:	● Counting coins
10. Key concepts in data structures may include but is not limited to:	● Data ● Object ● Type
11. Basic operations for various linked lists may include but is not limited to:	● Insertion ● Deletion ● Reverse ● Display
12. Basic operations in stacks may include but is not limited to:	● Push ● Pop
13. Basic operations in queues may include but is not limited to:	● Enqueue ● Dequeue
14. Categories of sorting techniques may include but is not limited to:	● In place ● Not in place ● Stable ● Not stable ● Adaptive ● Non-adaptive
15. Types of Sorting algorithms may include but is not limited to:	● Bubble sort ● Insertion sort ● Selection sort

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

Required skills

The individual needs to demonstrate the following skills:

- Communications (verbal and written);
- Time management;
- Problem solving;
- Planning;
- Decision Making;
- Research;

Required knowledge

The individual needs to demonstrate knowledge of:

- Fundamental principles of algorithms
- Fundamental concepts of data structures
- Linked lists
- Stacks and queues
- Search techniques
- Sorting techniques

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Wrote an algorithm 1.2 Demonstrated array operations 1.3 Demonstrated basic operations for the various linked lists 1.4 Demonstrated basic operations in stacks and queues 1.5 Demonstrated search techniques 1.6 Demonstrated sorting algorithms
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace where assessment can take place 2.2 Appropriately simulated environment where assessment can take place 2.3 Resources relevant to proposed activity or task
3. Methods of Assessment	Competency may be assessed through: 3.1 Oral questioning 3.2 Practical tests

	3.3 Observation 3.4 Written tests
4. Context of Assessment	Competency may be assessed 4.1 Off the job 4.2 on the job 4.3 During industrial attachment
5. Guidance information for assessment	5.1 Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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