



TECHNICAL UNIVERISTRY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

UNIVERSITY EXAMINATION FOR DEGREE IN:
BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY
(BSIT 12S J-FT Y3 S1)

ICS 2301: DESIGN & ANALYSIS OF ALGORITHM

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2014
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Attempt question **ONE (Compulsory)** and any other **TWO** questions
Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One (Compulsory)

- a) Give any FOUR considerations for the choice of an algorithm. **(4 marks)**
- b) Explain any THREE properties of an algorithm **(4 marks)**
- c) State any FOUR reasons why algorithms can be considered as a technology **(4 marks)**
- d) What is the formula for the variable count in terms of n after the following algorithm fragment is executed? **(5 marks)**
- (i) Count = 0;
 - (ii) For I = 1 through 3 do
 - (iii) For K = 1 through i do
 - (iv) Count = Count + 1
- End for loops
- e) Consider the following statements in the pseudo code below, what list of elements would be the array B. **(4 marks)**
- Declare B (6) as integers
Index = 0

```
DO WHILE Index < 6
B (Index) = Index *2
Index = Index + 1
END DO
```

- f) Write the algorithm for insertion sort and analyze its time complexity for the best and the worst case. **(9 marks)**

Question Two

- a) (i) Define space and time complexities of an algorithm. **(4 marks)**
(ii) Bring out the necessity of time and space complexity analysis with suitable examples. **(6 marks)**
- b) (i) Write the algorithm for bubble sort **(6 marks)**
(ii) Apply the algorithm in question b(i) above to sort the list EXAMPLE **(4 marks)**

Question Three

- a) Define the following terms:
(i) Algorithm
(ii) An instance of a problem
(iii) Loop invariant **(6 marks)**
- b) Explain the various asymptotic notations with the properties. **(6 marks)**
- c) Explain the time complexity of the following algorithm fragment in terms of n **(4 marks)**
1) For i = 1 through n do
2) For j = i through i + 3 do
- Constant number of steps

end for loops;
- d) Explain any TWO areas in computing where algorithms can be used. **(2 marks)**
- e) Below is a pseudo code algorithm that illustrates the calculation of the mean (average) of a set of n numbers, calculate the computing time for this algorithm in terms of input size n. **(2 marks)**
1. n = read input from user
2. sum = 0
3. i = 0
4. while i < n
5. Number = read input from user
6. Sum = sum + number
7. i = i + 1
8. Mean = sum/n

Question Four

- a) Find all pair shortest paths for the diagram shown below by Floyd's algorithm **(4 marks)**
- b) Differentiate between Deterministic and Non Deterministic algorithms **(4 marks)**
- c) (i) Write an algorithm to merge sort using divide and conquer strategy **(6 marks)**
(ii) Trace the algorithm in question c(i) above for the input set {4, 7, 1, 3, 8, 5} **(6 marks)**

Question Five

- a) List and explain the steps in the design and analysis of algorithm. **(8 marks)**
- b) Compute the by-oh running time of the following code segment. **(3 marks)**
for (i = 2; i < n; i ++) {
sum + = i;
}
- c) State any TWO factors that influence the running time of an algorithm **(2 marks)**
- d) (i) Write an algorithm for the selection sort **(4 marks)**
(ii) Calculate the computing time for this algorithm in terms of input size n **(3 marks)**