

**KABARAK**



**UNIVERSITY**

**EXAMINATIONS**

**2008/2009 ACADEMIC YEAR**

**FOR THE DEGREE OF BACHELOR OF SCIENCE IN  
COMPUTER SCIENCE**

**COURSE CODE: COMP 311**

**COURSE TITLE: DESIGN AND ANALYSIS OF  
ALGORITHMS**

**STREAM: Y3S1**

**DAY: FRIDAY**

**TIME: 9.00 – 11.00 A.M.**

**DATE: 20/03/2009**

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**INSTRUCTIONS:**

Answer Question 1 and two other Questions

**PLEASE TURN OVER**

**Question 1 (30 Marks)**

- (a) Explain why enumerating all strings of length  $n$ , for large values of  $n$  is not computable. (2 Marks)
- (b) (i) Write algorithm to reverse elements of an array (2 Marks)  
(ii) Determine the running time of algorithm in b (i) (2 Marks)
- (c) Determine the running time of the following algorithm (4 Marks)
- ```
algorithm alg1
  For m=1 to n step 1
    Display(m)
    For r=1 to n step 3
      For s=1 to n step 1
        display(s)
      next s
    next r
  next m
End algorithm
```
- (d) Compare and contrast divide and conquer and Dynamic strategies of developing algorithms (5 Marks)
- (e) (i) Describe four types of research methods in computer science (4 marks)  
(ii) Discuss how they have been used in development Design and analysis of algorithms knowledge (6 Marks)
- (f) Draw the following Turing machines  $\Sigma(a,b)$  for A language of length divisible by 3 or 5 containing only a's (5 Marks)

**Question 2 (20 Marks)**

- (a) (i) Write Booyer-more algorithm (4 Marks)  
(ii) Determine the running time of Booye-More algorithm in e(i) (2 Marks)

- (b) Determine the running time of the following algorithm (4 Marks)

```
algorithm alg2
  For r=1 to n step 3
    s=1
    while(s<n)
      s=s+1
      if (s =>100)
        display(s)
      End if
    End while
  next r
End algorithm
```

- (c) Describe Turing machines and their application in computer science (4 Marks)
- (d) Discuss six differences between run time obtained using asymptotic notation and the actual time obtained when running the algorithm on actual computer (6 Marks)

### Question 3 (20 Marks)

- (a) Explain four characteristics of an algorithm (2 Marks)
- (b) Draw the following Turing machines that recognize  $\Sigma(a,b)$
- (i) A language that contains aaaa (3 Marks)
  - (ii) A language that starts with substring bba (3 Marks)
  - (iii) A language that ends with substring baba (3 Marks)
  - (iv) A language that doesn't contain with substring bbb (3 Marks)
- (c) (i) Write a search2-3 algorithm (4 Marks)
- (ii) Determine the running time of search23 algorithm (2 Marks)

### Question 4 (20 Marks)

- (a) (i) Explain why computing all possible combination of stations is not computable for automobile factory having two assembly lines with many stations. (2 Marks)
- (ii) Describe the fastest-way scheduling dynamic algorithm for automobile factory having two assembly lines (8 Marks)

- (b) (i) Write a recursive Fibonacci algorithm that displays the fibonacci of first n Numbers (3 Marks)
- (ii) Write an iterative Fibonacci algorithm that displays the fibonacci of first n numbers and marks all even number with a \*. (4 Marks)
- (iii) Determine the running time of algorithm in c(ii) (3 Marks)

**Question 5 (20 Marks)**

- (a) (i) Write a breadth first search algorithm (5 marks)
- (ii) Determine the running time of breadth first search algorithm (3 Marks)
- (b) (i) Write Dijkstra algorithm (5 Marks)
- (ii) Determine the running time of Dijkstra algorithm (2 Marks)
- (c) Describe pseudo code and why it's suitable language for designing algorithms (5 Marks)