KABARAK **UNIVERSITY**

EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: **COMP 311**

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

STREAM: **Y3S1**

DAY: **MONDAY**

TIME: **8.30 - 10.30 A.M.**

DATE: **15/12/2008**

INSTRUCTIONS:

Answer Question **1** and **two other** Questions

PLEASE TURN OVER

Question 1 (30 Marks)

(a) (i)   What is an algorithm? (1 Mark)
   (ii) Describe four characteristics of an algorithm (2 Marks)

(b) (i) Write Quick sort algorithm (6 Marks)
    (ii) Determine the running time of b(i) quick sort algorithm (3 Marks)

(c) Determine the running time of the following algorithm (4 Marks)

```
Sub alg1
        For r=1 to 2n
            s=n-4
            while(s<n)
                    s=s+1
                    if (s =4 or s=9)
                            for m=1 to ½n²
                                display(m)
                            next m
                    End if
            End while
        next r
End Sub
```

(e) Write an analogy algorithm (3 Marks)

(f) Explain the following types of analysis

    (i) Best case (1 Mark)
    (ii) Worst case (1 Mark)
    (iii) Average case (1 Mark)

(g) Describe the five steps for carrying out experimental algorithmic analysis (5 marks)

(h) Describe divide and conquer method of developing algorithms (3 marks)

Question 2 (20 Marks)

(a) (i) Write merge sort algorithm that sorts numbers in an array in ascending order
  (6 Marks)
   (ii) Determine the running time of merge sort   algorithm (4 marks)

(b) (i) Describe the greedy method of developing algorithms (3 marks)

  (ii) Describe Fractional knapsack problem (1 Mark)

  (iii) Write the Fractional knapsack algorithm (4 Marks)

  (iv) Determine the running time of the Fractional knapsack (2 Marks)

Question 3 (20 Marks)

(a) (i) Write a dynamic Longest sequence problem   algorithm   (5 marks)
(ii Determine the running time of the Longest sequence problem algorithm   (2 Marks)

(b)   Draw the following Turing machines that recognize $\Sigma(0,1)$

      (i) A language of length divisible by 3   (3 Marks)

      (ii). A language that starts with substring 1001   (3 Marks).

      (iii)   A language that contains substring 000   (2 Marks)

(c) Briefly describe the asymptotic notation. Give one advantage of using asymptotic notations to analyze algorithms.   (5 Marks)

Question 4 (20 Marks)

(a) (i) Write a brute force pattern matching algorithm   (5 marks)

(ii Determine the running time of brute force pattern matching algorithm   (2 Marks)

(b) Write a simple genetic algorithm   (4 Marks)

(c) Describe Dynamic method of solving problems   (5 Marks)

(d) Describe the following growth functions, give one example of one algorithm each

      (i)   Linear growth   (1 Mark)

      (ii)   Polynomial growth   (1 Mark)

      (ii)   Exponential growth   (2 Marks)

Question 5 (20 Marks)

(a) Write the fastest-way scheduling dynamic algorithm for automobile factory having two assembly lines   (8 Marks)

(b)   Give four advantages of using standard algorithms while developing a system.
                                                                    (4 Marks)

(c)   (i) Write a recursive algorithm of Binary search algorithm   (5 Marks)

      (ii) Determine the running time of   Binary search algorithm   (3 Marks)