

**KING SAUD UNIVERSITY**  
COLLEGE OF COMPUTER & INFORMATION SCIENCES  
DEPT OF COMPUTER SCIENCE

CSC512 Computer Algorithms

First Semester 1427/1428 AH

Due:

Dec 4 at start of class

Instructor:

Dr. Aqil Azmi

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**Assignment #4**

1. Use the Rabin-Karp string matching algorithm on text  $T = abbcabacbabac$  searching for the pattern  $P = abacb$  using modulo **(a)**  $q = 7$ . **(b)**  $q = 89$ . For computing the signature, let  $a = 0$ ,  $b = 1$ ,  $c = 2$ .
2. Solve the following recurrence relations using **(a)** substitution; **(b)** master table.
$$T(n) = \begin{cases} T(1) & n \leq 2 \\ 7T(n/4) + 18n^2 & n > 2. \end{cases}$$
3. Solve the recurrence relation using substitution:  $T(n) = T(n - 1) + \log n$ . Assume that  $T(1) = C$  for  $n = 1$ .
4. Suppose we modified the binary search algorithm so that instead of splitting the array from the middle it splits it  $\frac{1}{3} : \frac{2}{3}$ . **(a)** Write the equation for computing the new split point  $m$ . **(b)** Draw the binary decision tree for  $n = 12$ . **(c)** Compute the average number of comparisons for successful and unsuccessful searches. **(d)** For a general  $n$  what is the maximum number of comparisons you need to do in order to determine if the element is/is not in the list? **[Hint:** the original mid point in the binary search algorithm is based on  $m \leftarrow \lfloor i + \frac{1}{2}(j - i) \rfloor$ ]