Kingdom of Saudi Arabia
المملكة العربية السعودية
Ministry of Education
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الكلية الجامعية بأضم
Computer Science Department
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First Semester of 2018-1439/1440H Academic Year

Computation Theory Course, 6803415-3

BONUS ASSIGNMENT

-Solutions-

Last Delivery Date: Group One and Two: Sunday, 09 / 04 / 1440 H – 16 / 12 / 2018

Question One: *2 Mark*

Choose the best answer.

1. Which one of the following is not an asymptotic notation for the function: $f(n) = n^2$?
a) $O(n)$
b) $\boldsymbol{O(nlog^2n)}$
c) $O(\frac{1}{n})$
d) All of them

2.Which one of the following languages can be generated by the grammar:

$$S \rightarrow 0S0 \mid 0S1 \mid 1S0 \mid 1S1 \mid 0$$

a) L = {w | the length of w is odd and its middle is 0}
b) L = {w | the length of w is odd}
c) L = {w | w contains at least 2 1's }
d) None of the above

3. The language: $\{0^n1^n0^n1^n \mid n \geq 0\}$ is a context free language.
a) True
b) False

4. Is the formula $(\boldsymbol{x} \vee \boldsymbol{y}) \wedge (\boldsymbol{x} \vee \bar{\boldsymbol{y}}) \wedge (\bar{\boldsymbol{x}} \vee \boldsymbol{y}) \wedge (\bar{\boldsymbol{x}} \vee \bar{\boldsymbol{y}})$ satisfiable?
a) True
b) False

Question Two: *1 Mark*
Show that NP is closed under the star operation.
Answer of Question Two:
Let the language A ∈ NP. By constructing NTM *L* to decide A* in nondeterministic polynomial time, we can easily proof that NP is closed under the star operation. *L* = "On input w: 1. Nondeterministically divide w into pieces $w = x_1x_2 \cdots x_k$. 2. For each x_i, nondeterministically guess the certificates that show $x_i \in A$. 3. Verify all certificates if possible, then accept. Otherwise, if verification fails, reject ."

Remember, *"Success is 1% inspiration and 99% perspiration"* 😉

If you have any questions, feel free to ask me through my email
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