Oxford College of Engineering and Management
Assignment - II
Mathematical Foundation of Computer Science
BCA Third Year, Fifth Semester

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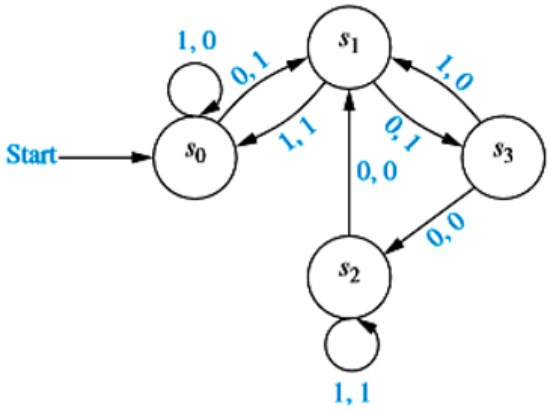
1. Using induction prove that, $6.7^n-2.3^n$ is divisible by 4, for all n>=1.
2. What is recurrence relation? Someone deposits $10,990 in a savings account at a bank yielding 10% per year with interest compounded annually. How much money will be in the account after 27 years?
3. How can you solve linear homogeneous recurrence relation? Explain. Solve the given recurrence relation for the initial condition $a_0 = 2$, $a_1 = 4$ and $a_2 = 5$.
$$a_n=7a_{n-1} – 10a_{n-2} + 16a_{n-3}.$$
4. Fibonacci series is given by the recurrence relation $f_n - f_{n-1} - f_{n-2} = 0, n>=3$, and initial conditions $f_1=1$, $f_2=2$. Find the explicit formula for the fibonacci sequence.
5. Define grammar and language. Write about different types of grammar.
6. Solve the recurrence relation $a_n = a_{n-1}+2a_{n-2}$ where $a_0=2$ and $a_1=7$
7. State the principles of Mathematical Induction. Prove by Mathematical induction that:
$$1.2 + 2.3 + \ldots + n.(n+1) = n(n+1)(n+2)/2$$
8. If an integer a is such that a-2 is divisible by 3 than a^2-1 is divisible by 3. Prove it by using direct proof method.
9. Show that the square of an even number is an even number using direct proof.
10. Solve the recurrence relation $a_n = 2a_{n-1} – a_{n-2}$ for $n \geq 2$ and $a_0 = 3$, $a_1 = 6$.
11. Consider the following grammar where T={a,b}, N={σ, A} with production rules { $\sigma \rightarrow b\sigma, \sigma \rightarrow aA$, $A \rightarrow a\sigma, A \rightarrow bA$, $A \rightarrow a$, $\sigma \rightarrow b$}. Determine whether the given grammar is context-sensitive, regular or context-free, or none of these.
12. Construct the state table for the finite state machine with the state diagram shown in following figure:



13. Construct the state diagram for the finite state machine with the state table shown in following figure:

	f		g	
State	**0**	**1**	**0**	**1**
s_0	s_1	s_3	1	0
s_1	s_1	s_2	1	1
s_2	s_3	s_4	0	0
s_3	s_1	s_0	0	0
s_4	s_3	s_4	0	0

Instructions:

- Assignment should be submitted before 3rd of Falgun 2075..