Sem V (CBScheme) K-2019 "DSAT" May 2022

University of Mumbai

Examinations Summer 2022

30/5/2022

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The degree of any vertex of graph is ....?
Option A:	The number of edges incident with vertex
Option B:	Number of vertex in a graph
Option C:	Number of vertices adjacent to that vertex
Option D:	Number of edges in a graph
2.	Power set of empty or Null set has exactly _____ subset.
Option A:	One
Option B:	Two
Option C:	Three
Option D:	Zero
3.	Determine the partitions of the set {3, 4, 5, 6, 7} from the following subsets.
Option A:	{3,5}, {3,6,7}, {4,5,6}
Option B:	{3,4,6}, {7}
Option C:	{5,6}, {5,7}
Option D:	{3}, {4,6}, {5}, {7}
4.	Let A and B be two non-empty relations on a set S. Which of the following statements is false?
Option A:	A and B are transitive ⇒ A∩B is transitive
Option B:	A and B are symmetric ⇒ A∪B is symmetric
Option C:	A and B are transitive ⇒ A∪B is not transitive
Option D:	A and B are reflexive ⇒ A∩B is reflexive
5.	The graph representing universal relation is called
Option A:	complete digraph
Option B:	partial digraph
Option C:	empty graph
Option D:	partial subgraph
6.	A _____ in a graph G is a circuit which consists of every vertex (except first/last vertex) of G exactly once.

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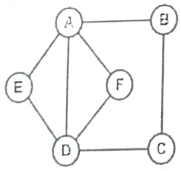
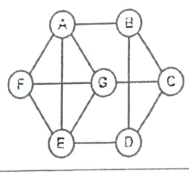
Option A:	Euler path
Option B:	Hamiltonian path
Option C:	Planar graph
Option D:	Path complement graph
7.	In Finite Automata Transition function maps _____
Option A:	$\Sigma * Q \rightarrow \Sigma$
Option B:	$Q * \Sigma \rightarrow Q$
Option C:	$Q*Q \rightarrow \Sigma$
Option D:	$\Sigma*\Sigma \rightarrow Q$
8.	In Moore Machine, the output depends upon?
Option A:	Present State
Option B:	Previous State
Option C:	Present State and Input
Option D:	Only input
9.	Which sentence can be generated by following CFG? S-> iCtS | iCtSeS | a C->b
Option A:	ibbitaea
Option B:	ibtibtaea
Option C:	ibtiibtea
Option D:	ibtibea
10.	A push down automaton employs _____ data structure.
Option A:	Queue
Option B:	Linked List
Option C:	Hash Table
Option D:	Stack

Please use either of the 3 option given below while setting up the subjective/descriptive questions

Option 1

Q2, Q3 and Q4. (20 Marks Each)	**Solve any Four out of Six** **5 marks each** ***Please delete the instruction shown in front of every sub question***
A	Prove using Mathematical Induction that :- $1+3+5+...+(2n-1) = n^2$
B	Let A = {a,b,c}. Draw Hasse Diagram for $(p(A), \subseteq)$
C	Determine the Eulerian path and Hamiltonian path, if exist, in the following graph A)  D) 
D	Differentiate DFA and NFA.
E	Define Regular Expression and give Regular Expression for following language :- (i) Set of all strings that end with 1 and has no substring 00 (ii) Set of all strings on {a, b} with even number of a's followed by odd number of b's
F	Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse tree for the string 'bbaaabbaba'. $S \rightarrow aB \mid bA$

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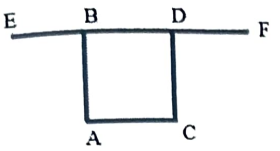
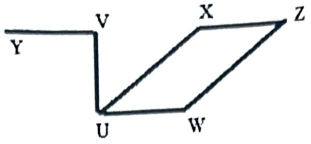
A → a | aS | bAA
B → b | bS | aBB
check grammar is ambiguous or not.

	Solve any Two Questions out of Three	10 marks each
Q3		
A	Use the laws of logic to show that i) $[(p \rightarrow q) \wedge \neg q] \rightarrow \neg p$ is a tautology ii) $\neg (p \vee (\neg p \wedge q))$ and $(\neg p \wedge \neg q)$ are logically equivalent	
B	Let A= {1,2,3,4,5}, let R= {{1,1}, {1,2}, {2,1}, {2,2}, {3,3}, {3,4}, {4,3}, {4,4}, {5,5}} and S= {{1,1}, {2,2}, {3,3},{4,4},{4,5},{5,4},{5,5}} be the relations on A. Find the smallest equivalence containing relation R and S.	
C	Determine if following graphs G1 and G2 are isomorphic or not.  (G1)  (G2)	

	Solve any Two Questions out of Three	10 marks each
Q4		
A	Design Mealy machine to change each occurrence of string "baa" by "bab" over $\sum$ ={a,b}.	
B	Convert following context free grammar to equivalent chomsky normal form . S → bA	aB A → bAA	aS	a B → aBB	bS	b	
C	Define PDA and design a PDA to accept an even palindrome over {a, b}	