

Program: **Information Technology**

Examination: **TE Semester V**

Course Code: **_2.ITDO5014_** and Course Name: **_ Advanced Data structure and Analysis _**

Time: 2 hour

Max. Marks: 80

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	You are given a knapsack that can carry a maximum weight of 60. There are 4 items with weights {20, 30, 40, 70} and values {70, 80, 90, 200}. What is the maximum value of the items you can carry using the knapsack?
Option A:	160
Option B:	200
Option C:	170
Option D:	90
2.	You are given infinite coins of denominations 1, 3, 4. What is the total number of ways in which a sum of 7 can be achieved using these coins if the order of the coins is not important?
Option A:	4
Option B:	3
Option C:	5
Option D:	6
3.	The best and worst-case time complexity of Rabin-Karp String Matching algorithm is _____ and _____ respectively.
Option A:	$O(m^2)$ and $O(nm)$
Option B:	$O(n+m)$ and $O(nm)$
Option C:	$O(n+m)$ and $O(n^2)$
Option D:	$O(m^2)$ and $O(n^2)$
4.	Which of the following is the pattern for the prefix table with entries "0 0 0 1 2 1 2 3"?
Option A:	XYZXYZXY
Option B:	XYZXX
Option C:	XYZXYXYZ
Option D:	XXXYZYZX

5.	Let X be a problem that belongs to the class NP. Then which one of the following is TRUE?
Option A:	There is no polynomial time algorithm for X
Option B:	If X can be solved deterministically in polynomial time, then $P = NP$.
Option C:	If X is NP-hard, then it is NP-complete.
Option D:	X may be undecidable.
6.	What is the result of the recurrences which fall under second case of Master's theorem (let the recurrence be given by $T(n) = aT(n/b) + f(n)$ and $f(n) = nc$?
Option A:	$T(n) = O(n^{\log_b a})$
Option B:	$T(n) = O(nc \log n)$
Option C:	$T(n) = O(f(n))$
Option D:	$T(n) = O(n^2)$
7.	What is the Time complexity of the following Algorithm for $(i=1; i \leq n; i=i*2)$ { //Simple statement; }
Option A:	$O(n^2)$
Option B:	$O(n)$
Option C:	$O(\log n)$
Option D:	$O(n \log n)$
8.	Which of the following array elements represents a max-heap?
Option A:	8 10 12 25 14 17
Option B:	12 10 8 25 14 17
Option C:	25 17 14 12 10 8
Option D:	14 17 25 10 12 8
9.	What is Most Efficient Time Complexity of Topological Sorting is? (V – number of vertices, E – number of edges)
Option A:	$O(V + E)$
Option B:	$O(V)$
Option C:	$O(E)$
Option D:	$O(V * E)$

10.	Apply Quick sort on a given sequence 8 10 13 6 9 4 3 12. What is the sequence after first phase, pivot is first element?
Option A:	6 3 4 8 9 13 10 12
Option B:	6 4 3 8 10 9 13 12
Option C:	8 6 13 10 9 4 3 12
Option D:	8 6 4 3 9 13 10 12

Q2	Write short note on any Four out of Six	5 marks each
A	Genetic Algorithm	
B	Knuth Morris Pratt Algorithm	
C	Methods of Solving Recurrences	
D	All pair shortest path Algorithm	
E	Job sequencing with Deadlines	
F	Topological Sort	

Q3.	Solve any Two Questions out of Three	10 marks each
A	What is longest common subsequence problem? Find LCS for the following string: String X: ABCDGH String Y: AEDFHR	
B	Explain Travelling Salesman Problem with an example.	
C	Explain Red-Black Trees with example.	

Q4.	Solve any Two Questions out of Three	10 marks each
A	Solve the following knapsack problem by using greedy approach where $N=7, M=15, (P_1, P_2, P_3, P_4, P_5, P_6, P_7) = (10, 5, 15, 7, 6, 18, 3), (W_1, W_2, W_3, W_4, W_5, W_6, W_7) = (2, 3, 5, 7, 1, 4, 1)$	
B	Write a short note on Optimal Binary Search Tree.	
C	Explain KMP Pattern Matching algorithm with a suitable example.	