VIT-AP UNIVERSITY	Continuous Assessment Test – Fall semester (2025-26) -August 2025	
	Maximum Marks: 50	Duration: 90 Mins
Course Code: SWE 2009	Course Title: Analysis of Algorithms	
Set No: 6	Exam Type: **Closed Book**	School: SCOPE
Date: 19/08/2025	Slot: B1	Session: FN

Keeping mobile phone/smart watch, even in 'off' position is treated as exam malpractice

General Instructions if any Open Book/Open Notebook/Closed Book:

1. **"*fx* series" - non Programmable calculator are permitted : YES**
2. **Reference tables permitted : NO**

PART – A: Answer any ALL Questions, Each Question Carries 10 Marks (5×10=50 Marks)

1. Given the following array [58, 81, 22, 44, 26, 93, 17, 77, 31, 44, 55, 20] and assume that quick sort will be used to sort this array in ascending order. Select the value for the last element of the array, such that the partitioning performed by the quick sort is most balanced. Calculate the worst-case complexity through the recurrence relation. Also, explain why this makes quicksort perform efficiently. **(10 M)**

2. i. If $f(n) = a_m n^m + a_{m-1} n^{m-1} + \ldots\ldots\ldots + a_1 n + a_0$ and $a_m > 0$ then, $f(n) = O(n^m)$ **(5*2=10 M)**

   ii. If $4n^3 + 2n + 3 = O(n^3)$, is $4n^3 + 2n + 3 = o(n^3)$ or not.

3. Given the following array [32, 51, 22, 84, 66, 48, 96, 77, 41, 24, 52, 10] and assume that Merge sort will be used to sort this array in descending order. Calculate the average case complexity through recurrences relation. Also, explain why this makes merge sort perform efficiently as compare to the quicksort algorithm. **(10 M)**

4. Apply suitable asymptotic notation to compute the time complexity of the following functions. **(4+3+3 = 10 M)**

   (i). $6*2^n + n^2 = \text{Omega}(2^n)$

   (ii). Is $n! = o(n^n)$

   (iii) $2^{n+1} = O(2^n)$

5. Solve the following recurrence relation. **(5*2 = 10 M)**

   i. $T(n) = 4T(n/2) + n^2 . \text{root}(n)$.

   ii. $T(n) = T(n/2) + T(n/4) + T(n/8) + n$ using suitable method.

QP MAPPING

Q. No.	E/A/ T	Module Number	Marks	BL	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped
Q1	E	2	10	1	CO1, CO2	PO1, PO2		
Q2	A	1	10	2	CO1, CO3	PO3, PO4		
Q3	E	2	10	3	CO1, CO2	PO3, PO5		
Q4	A	1	10	3	CO2	PO2, PO3		
Q5	T	1	10	4	CO1, CO3	PO2, PO3		