BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER: IV**
BRANCH: CSE/IT **SESSION: SP/2020**

SUBJECT: CS206 DESIGN AND ANALYSIS OF ALGORITHM

TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates may attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

				CO	BL
Q1	(a)	For any two functions F(n) and g(n), show that if f(n)=Θ(g(n) then f(n)= O(g(n)) and f(n)= o(g(n)) and vice versa.	[2]	1	3
Q1	(b)	Show that the sequence $\{(1+(1/n))^n\}$ is increasing and bounded by 4.	[3]	1	3
Q2	(a)	Solve the Recurrence T(n)= T(9n/10) + n	[2]	2	6
Q2	(b)	Show that lg n! = Θ (n lgn)	[3]	2	5

Q3	(a)	Professor BIT proposes the following version of binary search
		bsearch(L,i,j,key) {
		if(i>j)
		return -1
		k=(i+j)/2
		if(key==L[k])
		return k
		if(key<L[k])
		return bsearch(L,i,k,key)
		else
		return bsearch(L,k+1,j,key) }
		Is the Professor's version correct? Justify your answer and find it's time complexity accordingly?
			[2]	3	3

Q3	(b)	What is a selection problem? Design the selection problem. Hint: How machine will take the input and provide output. Which conventional design strategy you follow for this design.	[3]	3	6
Q4	(a)	An n element array contains only the numbers 0,1,2. Write an O(n) algorithm/procedure/program to sort the numbers.	[2]	4	6
Q4	(b)	Write an algorithm for Quicksort and analysis it's time complexity. Explain with an example.	[3]	4	6
Q5	(a)	Show how Strassen's' algorithm computes $\begin{pmatrix} 3 & 1 \\ 4 & -1 \end{pmatrix}\begin{pmatrix} 2 & -5 \\ 6 & -3 \end{pmatrix}$.	[2]	5	4
Q5	(b)	Write a non-recursive version of merge sort. Make your algorithm as efficient as you can.	[3]	5	6

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