



B.TECH DEGREE EXAMINATIONS: NOV /DEC 2024

(Regulation 2018)

Fourth Semester

INFORMATION TECHNOLOGY

U18ITI4202: Design and Analysis of Algorithms

COURSE OUTCOMES

- CO1: Explain the fundamentals of analysis of algorithm.
- CO2: Explain mathematical analysis for recursive and non-recursive Algorithms.
- CO3: Explain the design techniques Brute force, Divide and Conquer, Decrease and Conquer, Dynamic programming.
- CO4: Explain the design techniques Greedy algorithms, back tracking, Branch and Bound.
- CO5: Explain the concepts of NP complete problems.

Time: Three Hours

Maximum Marks: 100

**Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)**

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|---|-----------------------|
| 1. Explain the Amortized efficiency | CO1 [K ₂] |
| 2. List the different problem types | CO1 [K ₂] |
| 3. List out the steps in Mathematical Analysis of non recursive Algorithms. | CO2 [K ₂] |
| 4. Write the algorithm to count the number of bits of a given positive integer | CO3 [K ₂] |
| 5. Compare divide & conquer design technique with dynamic programming. | CO3 [K ₂] |
| 6. List the pros and cons of Greedy approach | CO3 [K ₂] |
| 7. Explain Hamiltonian circuit problem and suggest the suitable design strategy to solve the problem? | CO4 [K ₂] |
| 8. Explain the 0/1 Knapsack problem? | CO4 [K ₂] |
| 9. Brief about cook's theorem-I | CO5 [K ₂] |
| 10. List the Computability classes | CO5 [K ₂] |

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) Design a recursive algorithm for computing 2^n for any non-negative integer n that is based on the formula $2^n = 2^{n-1} + 2^{n-1}$ 8 CO2 [K₃]
 b) Set up a recurrence relation for the number of additions made by the (Q.no. 11. a.) algorithm and solve it. 8 CO2 [K₃]

12. a) Explain and analyze the merge sort algorithm and apply the algorithm to Sort. 7, 4, 5, 2, 1, 3, 8, 6 8 CO3 [K₃]
 b) With an appropriate design strategy solve the Josephus problem with n prisoners and k=2 8 CO3 [K₃]

13. a) Explain the Job sequencing with deadlines. 8 CO4 [K₃]
 Given the following jobs with their deadlines and profits:

	Job1	Job2	Job3	Job4	Job
Deadline	2	1	3	2	4
Profit	80	50	100	70	120

Determine the maximum profit achievable and the optimal job sequence.

- b) Explain the Job assignment Problem using Branch and bound 8 CO4 [K₃]

	Job1	Job2	Job3	Job4
Person1	8	7	9	6
Person2	6	4	3	7
Person3	5	8	7	5
Person4	3	6	4	9

14. a) Explain the brute force string matching algorithm with an appropriate example 8 CO3 [K₂]
 b) Apply back tracking to solve the N queen's problem 8 CO4 [K₃]

15. a) Explain Analysis Framework in detail 8 CO1 [K₂]
 b) Construct a Huffman code for the following data: 8 CO4 [K₃]

Symbol	A	B	C	D	E	F	G
Frequency	10	15	7	25	30	12	6

Encode ABAECFABAGD using the code

16. Briefly explain NP-Hard and NP-Completeness with examples. 16 CO5 [K₃]
