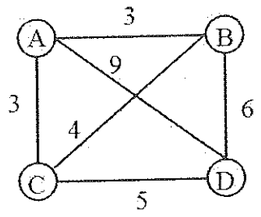
30. a. Use Kruskals algorithm and construct a Minimum Spanning Tree (MST) for the following graph.



(OR)

b. Explain 0/1 knapsack problem with greedy method and dynamic programming method with examples.

31. a. Explain 8 queen problem and its algorithm. Write its procedure with state space tree.

(OR)

b. Explain the algorithm for graph coloring problem with an example.

32. a. Solve the following Knapsack problem using branch and bound method

Items	Wi	Fi
1	2	9
2	3	6
3	2	4

With Knapsack capacity w = 6.

(OR)

b. Explain randomized algorithm for 'Hiring problem' and analyse the time complexity.

* * * * *

Reg. No.															

B.Tech. DEGREE EXAMINATION, JUNE 2019
1st to 7th Semester

15CS204J – ALGORITHM DESIGN AND ANALYSIS
(For the candidates admitted during the academic 2015 - 2016 to 2017 - 2018)

Note:
(i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45th minute.
(ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: Three Hours Max. Marks: 100

PART – A (20 × 1 = 20 Marks)
Answer **ALL** Questions

1. Two main measures for the efficiency of an algorithm are
(A) Processor and memory (B) Complexity and capacity
(C) Time and space (D) Data and space

2. What is the recurrence for worst case quick sort and what is the time complexity in worst case?
(A) Recurrence is T(n)=T(n–2)+O(n) and time complexity is O (n^n2) (B) Recurrence is T(n)=T(n–1)+O(n) and time complexity is O (n^n2)
(C) Recurrence is T(n)=2T(n/2)+O(n) and time complexity is O (n log n) (D) Recurrence is T(n)=T(n/10)+T(9n/10)+O(n) and time complexity is O (n log n)

3. Which of the given options provides the increasing order of asymptotic complexity of functions *f1, f2, f3 and f4? f1(n)=2^n, f2(n)=n^(3/2), f3(n)=n log n, f4(n)=n^n (log n).*
(A) f3, f2, f4, f1 (B) f3, f2, f1, f4
(C) f3, f3, f1, f4 (D) f2, f2, f4, f1

4. What is the solution to the recurrence T(n) = T(n/2) +n?
(A) O (log n) (B) O (n)
(C) O (n log n) (D) O (n^n2)

5. Merge sort uses
(A) Divide and conquer strategy (B) Greedy
(C) Array (D) Link list

6. Which of the following cases does not exist in complexity theory?
(A) Best case (B) Worst case
(C) Average case (D) Null case

7. Which sorting algorithms is faster?
(A) O (n^n 2) (B) O (n log n)
(C) O (n +k) (D) O (n^n 3)

8. Which of the following standard algorithms not a greedy algorithm?
(A) Dijkstra's shortest path algorithm (B) Prims algorithm
(C) Huffman coding (D) Bellman ford shortest path algorithm

9. Which of the following is true about Huffman coding?
   (A) Huffman coding may become lossy in some cases
   (B) Huffman codes may not be optimal lossless codes in some cases
   (C) In Huffman coding, no code is prefix of any other code
   (D) Huffman coding may have good optimal complexity

10. We use dynamic programming approach when
   (A) It provides optimal solution
   (B) The solution has optimal substructure
   (C) The given problem can be reduced to the 3-SAT problem
   (D) It is faster than greedy

11. The concept of Kruskal's algorithm is based on the _____ nature of the graph.
   (A) Connection
   (B) Cyclic
   (C) Acyclic
   (D) Sorted

12. Which of the following algorithm design technique is used in finding all pairs of shortest distances in a graph?
   (A) Dynamic programming
   (B) Back tracking
   (C) Greedy
   (D) Divide and conquer

13. In which of the following cases N queens problem does not exist.
   (A) n = 2 and n = 4
   (B) n = 4 and n = 6
   (C) n = 4 and n = 8
   (D) n = 2 and n = 3

14. A solution that either maximizes or minimizes a given objective function is called an _____.
   (A) Optimal solution
   (B) Feasible solution
   (C) Local solution
   (D) Exact solution

15. The complexity of Hamiltonian cycle algorithm is _____.
   (A) $\frac{(n-1)^n-1}{n-2}$
   (B) $\frac{(n-1)^2-1}{n-2}$
   (C) $\frac{(n-1)-1}{n-2}$
   (D) $\frac{(n-1)-2}{(n-2)^n}$

16. The Knapsack problem belongs to the domain of ____ problems.
   (A) Optimization
   (B) NP complete
   (C) Lincar solution
   (D) Sorting

17. The running time of quick sort depends heavily on the selection of
   (A) Number of inputs
   (B) Arrangement of elements in array
   (C) Sizc of elements
   (D) Pivot element

18. The operation of processing each element in the list is known as
   (A) Sorting
   (B) Merging
   (C) Inserting
   (D) Traversal

19. T(n) = 2T(n/2) + n2 then T(n) =
   (A) O (n^3)
   (B) O (n^2)
   (C) O (n)
   (D) O (n^4)

20. Assuming P! = NP which of the following is true?
   (A) NP hard = NP
   (B) NP complete = P
   (C) NP = ϕ
   (D) NP complete UP = ϕ

PART – B (5 × 4 = 20 Marks)
Answer **ANY FIVE** Questions

21. Solve the following recurrence equation using substitution method $t_n = t_{n-1} + 3, t_1 = 4$.

22. Prove the equations using mathematical induction
$$\sum_{i=1}^{n} i^3 = \left[\frac{n(n+1)}{2}\right]^2.$$

23. Multiply the following two matrices using Strassen's multiplication method
$$A = \begin{pmatrix} a11 & a12 \\ a21 & a22 \end{pmatrix} B = \begin{pmatrix} b11 & b12 \\ b21 & b22 \end{pmatrix}$$

24. Write 0/1 Knapsack algorithm.

25. Draw the state-space tree for 4-queen problem using DFS.

26. Write the algorithm for sum of subsets.

27. Distinguish between randomized and deterministic algorithms.

PART – C (5 × 12 = 60 Marks)
Answer **ALL** Questions

28. a.i. Solve the recurrence relation using master theorem $T(n) = \delta T(n/2) + 10n^2, T(0) = 0$.

ii. Solve the recurrence equation $t_n = nt_{n-1}$ for $n > 1, t_0 = 1$.

(OR)

b.i. Elaboratc the asymptotic notations used in algorithm analysis.

ii. Describe the performance analysis of an algorithm in detail.

29. a. Write an algorithm to perform merge sort on a sorted listed of elements. Analyse the algorithm for best case, average case and worst case.

(OR)

b. Illustrate the various stages of binary search algorithm to analyze its complexity.