1. List and explain all commonly used running times of an algorithm.
2. State the real world problem which relates to Bipartite matching.
3. Design an algorithm for Interval scheduling algorithm.
4. Apply master theorem for the following time complexities.

i) $T(n) = 3T\left(\frac{n}{2}\right) + n^4 T(n) = 3T\left(\frac{n}{2}\right) + n^4$

ii) $T(n) = 4T\left(\frac{n}{2}\right) + n^3 T(n) = 4T\left(\frac{n}{2}\right) + n^3$

iii) $T(n) = T\left(\frac{n}{2}\right) + 2^n T(n) = T\left(\frac{n}{2}\right) + 2^n$

5. Express the following in asymptotic notation in terms of Big-O, Omega and Theta.

i)n! ii) 6* 2n + n2 iii) 100n+5 iv) 2n2+ log (n)

6. Define three asymptotic notations and express the following using asymptotic notations in terms of Big-O, Omega and Theta.

i)100n +5 ii) n(n-1)/2

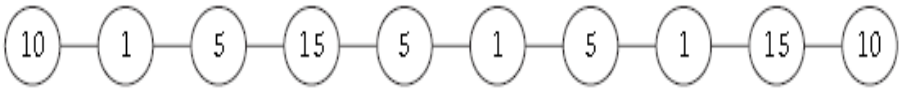
7. 7Check if the following equalities are correct or not. If not correct, then write the proper justification for the same.

i.5n^2 – 6n = θ(n^2)

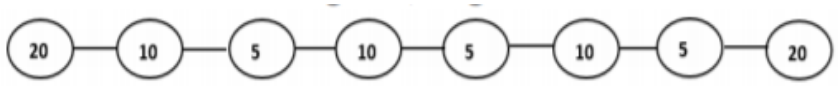
ii.n! = O(n^n)

iii.2n22n + n logn = θ(n22n)

8. In the given graph, consider two players P1 and P2 where they select nodes alternately with P1 moving first. Each node has a value bi, represented inside the node. At all times, the set of all selected nodes must form an independent set in G. If the target bound B=20 is to be achieved by P2 is it possible?



9.
Consider the following graph for Competitive Facility Location problem. Given 2 players P1 & P2 with P2 moving first, target bounds 30 & 35 is achievable or not for P1.



10. For the Bipartite Matching problem, explain the working of the algorithm with an example graph.
11. Give examples for linear time and quadratic time complexity of an algorithm.
12. Given a function of polynomial degree d, with co-efficient a_d as positive, prove that $f=O(n^d)$.
13. Identify the stable matching set between the students and colleges given the following. (Assume college approaches students for admission)

Students preference list

S1	C1	C2	C3
S2	C2	C3	C1
S3	C3	C1	C2

College preference list

C1	S2	S3	S1
C2	S1	S2	S3
C3	S1	S2	S3

14. Determine the stable matching set S for the following set of men and women using Gale-Shapley algorithm.

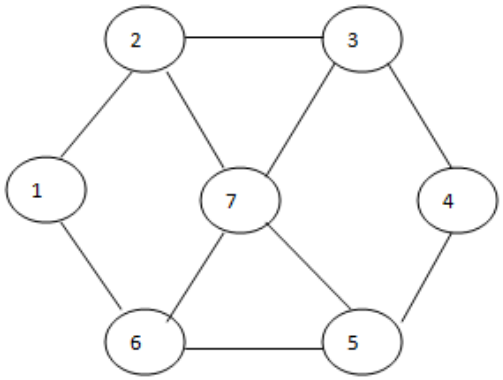
Men's Preference List						Women's Preference List					
A	R	Q	S	P		P	A	B	D	C	
B	Q	P	R	S		Q	C	A	D	BC	Q
	S	P	R		R	C	B	D	A		
D	R	P	S	Q		S	B	A	C	D	

15. What is meant by "Best Valid Partner" with respect to Gale-Shapley algorithm? Prove that "Every execution of the G-S algorithm results in the set S*".

16. Prove that "Every execution of the G-S algorithm results in the stable matching set S".

17. Describe an algorithm to determine whether a given graph is bipartite or not. Using the same algorithm determine whether the given graph is bipartite or not.or Design an algorithm to determine whether a given graph is bipartite or not.

18. Identify how many k-size independent sets are possible for the following graph for k=3,4.



19. Identify the number of inversions for the array {1,5,4,8,10,2,6,9,12,11} using divide and conquer method.

20. Identify the BFS traversal for the following graph with source as 1.

21. Define Graph, its type, implementation, path, cycle, applications of graphs.

22. Show the working of BFS over the given graph. Mention the data structures used and illustrate same with a table representation.

23. Write the DFS algorithm and show the working of DFS over the given graph. Illustrate the same using its Data Structure.

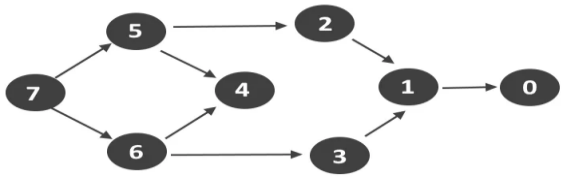
24. Apply Topological ordering algorithm over the given graph. Comment on the running time of the algorithm. Illustrate the improvisation of the running time of the algorithm.

25. Describe and derive the time complexity of an algorithm to determine the number of inversions for an unsorted list of numbers using divide and conquer approach.Identify the DFS traversal for the following graph using the source v1.

26. Prove the following statement "Merge sort is asymptotically optimal compare-based sorting algorithm".

27. Write an algorithm to find out the maximum distance between a pair of points in a given plane with n points.
28. Prove that “For every b>1 and every x>0, we have logbn = O(nx)”.
29. Describe the five representative problems with examples to each.
30. List the different applications of BFS and DFS algorithms.
31. Analyze the running time of Merge-Sort using the following methods:
    i. Unrolling method ii. Substituting a solution.
32. Write the Counting Inversion algorithm. Find out the number of inversions for the following set of number. (25, 14, 19, 22, 15, 16, 20, 10, 17)
33. Find the Topological ordering for the following given graph using Source Removal method and DFS method.

Fig.4(a)



34. Write an algorithm to sort the given numbers using divide and conquer method.