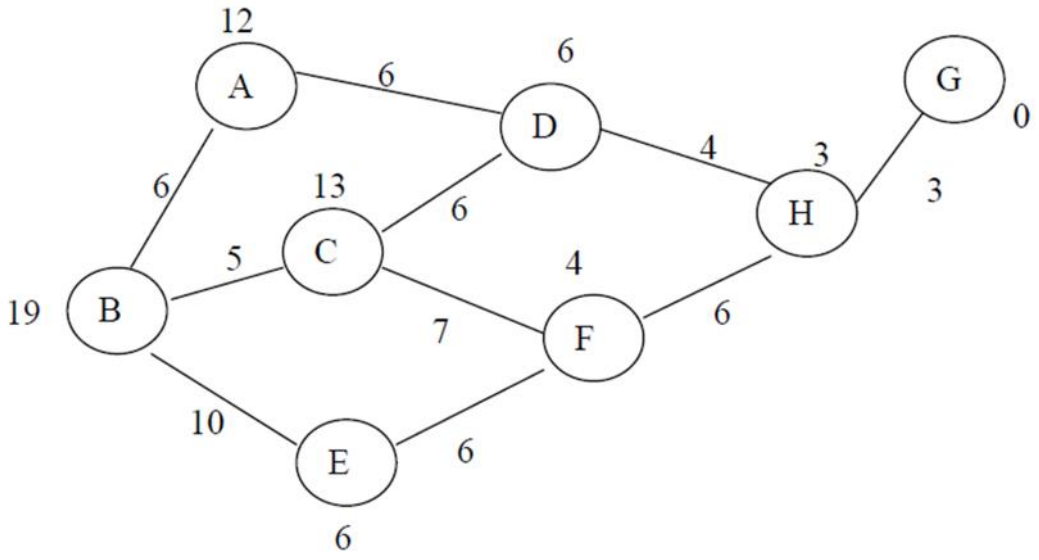
1. What is informed search and uninformed search? Which are the informed search algorithms?
2. Explain Depth First Search (DFS) algorithm with suitable example.
3. With suitable example, explain following terms related to binary tree.
    - Parent node
    - Leaf node
    - Internal and external node
    - Degree of a node

4. In following graph, B is starting node and G is End node, Find the traversal using Greedy Search Algorithm.



5. In a minimization problem, function value of 35 is updated to new value of 50 at temperature 100°C. Determine the probability of accepting the new solution if simulated annealing algorithm is used.
6. In a minimization problem, current value of a certain parameter *x* is 20. The lower and upper bounds of parameter *x* are 10 and 50 respectively. If simulated annealing

algorithm is used to update x using 5 random numbers having sum 1.87, what will be the updated value?

7. Ant colony optimization is used to solve a travelling salesmen problem with 5 stations. The distance matrix is given below. Considering starting station as A, what is the % probability that an ant will choose the path 1 to 3? Assume initial pheromone deposition level as 1.

	1	2	3	4
1	0	32	51	28
2	32	0	43	38
3	51	43	0	49
4	28	38	49	0

8. Ant colony optimization is used to solve a travelling salesmen problem with 5 stations. The distance matrix is given below. Considering starting station as A, what is the % probability that an ant will choose the path A to D? Assume initial pheromone deposition level as 1.

	A	B	C	D
A	0	32	51	28
B	32	0	43	38
C	51	43	0	49
D	28	38	49	0

9. For the distance matrix shown in Fig. below, what is the pheromone deposition by an ant which moves along path A-C-D-B-A?

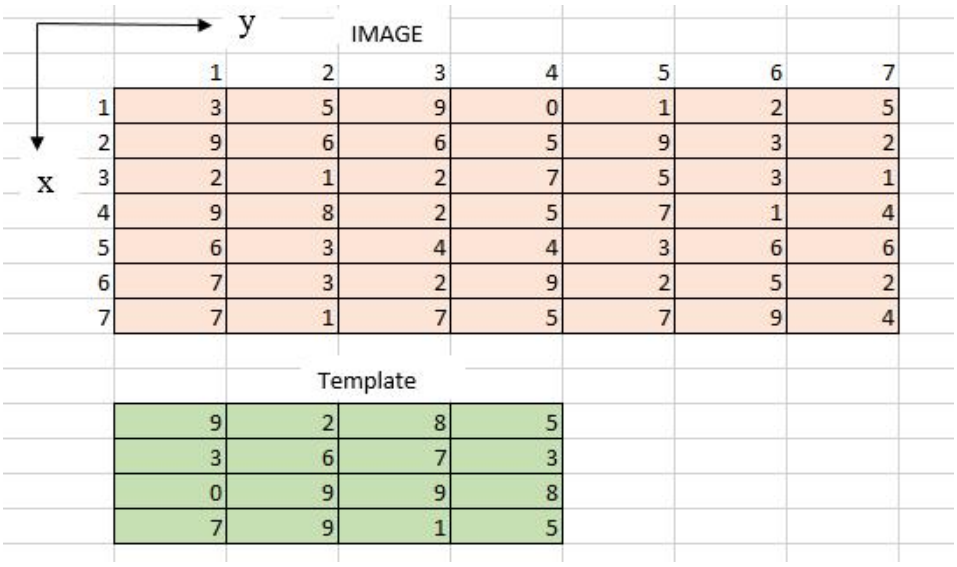
	A	B	C	D
A	0	32	51	28
B	32	0	43	38
C	51	43	0	49
D	28	38	49	0

10. Explain the steps of real coded genetic algorithm.
11. What is Tabu search? Explain application of Tabu search in Robotics?

12. Explain with suitable example the normalized cross correlation method for template matching.
13. For the image shown below, make two segments using region growing method.

3	4	0	0	2	4	4	2
3	1	0	2	1	3	4	1
2	0	4	4	1	2	1	5
4	3	2	0	3	2	4	8
2	4	3	2	1	1	1	6
7	6	8	8	8	8	0	5
6	8	6	7	7	6	4	5
8	7	6	7	6	8	2	8

14. Write note on: Robot vision system.
15. Write note on: Imaging based automatic sorting and inspection
16. Calculate the performance index for translation (2, 2) for the image and template shown in Fig.



	1	2	3	4	5	6	7
1	3	5	9	0	1	2	5
2	9	6	6	5	9	3	2
3	2	1	2	7	5	3	1
4	9	8	2	5	7	1	4
5	6	3	4	4	3	6	6
6	7	3	2	9	2	5	2
7	7	1	7	5	7	9	4

9	2	8	5
3	6	7	3
0	9	9	8
7	9	1	5

17. Determine the x coordinate of the centroid of the grayscale image shown in Fig. below.

2	0	1	0
1	0	1	2

0	0	3	0
4	1	2	0

18. Determine the y coordinate of the centroid of the grayscale image shown in Fig. below.

2	0	1	0
1	0	1	2
0	0	3	0
4	1	2	0

19. Determine the gradient of intensity of a pixel having intensity 7 in the image given below. Use Prewitt operator.

4	6	5
3	7	8
2	9	1

20. For a certain binary image, following data operates. Determine the compression ratio using run length encoding.

1	1	1	1	1	1
1	1	1	1	0	0
0	0	0	0	0	0
0	0	0	0	0	0
1	1	1	1	1	0

21. Explain the application of simulated annealing algorithm for robot motion planning.
22. What are different methods to deal with moving obstacles?
23. Write note on: Path Planning Robot Control in Dynamic Environments
24. Explain the application of genetic algorithm for robot motion planning.
25. Explain with suitable example the application of real coded genetic algorithm for AGV route optimization.
26. Write note on visibility graph method for robot path planning.
27. What is AS/RS system? What are criteria for automated part storage in AS/RS system?

28. With suitable example, compare the performance of Bug 1 and distance bug algorithms.
29. Wrote note on Bug algorithms for obstacle avoidance.
30. Use A* algorithm to search the cell next to cell (1, 2) for shortest path while moving from cell (0, 0) to cell (3, 5).

(0,5)	(1,5)	(1,5)	(3,5)
(0,4)	(1,4)	(1,4)	(3,4)
(0,3)	(1, 3)	(1,3)	(3,3)
(0,2)	(1, 2)	(1,2)	(3,2)
(0, 1)	(1,1)	(1, 1)	(3,1)
(0,0)	(1,1)	(2,2)	(3,3)

31. Use A* algorithm to search the cell next to cell (1, 2) for shortest path while moving from cell (0, 0) to cell (3, 5). Cell (0, 2) is an obstacle.

(0,5)	(1,5)	(2,5)	(3,5)
(0,4)	(1,4)	(2,4)	(3,4)
(0,3)	(1, 3)	(2,3)	(3,3)
(0,2)	(1, 2)	(2,2)	(3,2)
(0, 1)	(1,1)	(2, 1)	(3,1)
(0,0)	(1,0)	(2,0)	(3,0)

32. Explain the real time scheduling in flexible manufacturing system.
33. Explain with suitable example techniques for automated storage and retrieval.
34. What are components of flexible manufacturing systems?
35. Write notes on :
    i) Automatic tool path generation
    ii) Applications of artificial intelligent techniques in flexible manufacturing systems.
    iii) Flexible manufacturing system.
    iv) Role of artificial intelligence in flexible manufacturing system