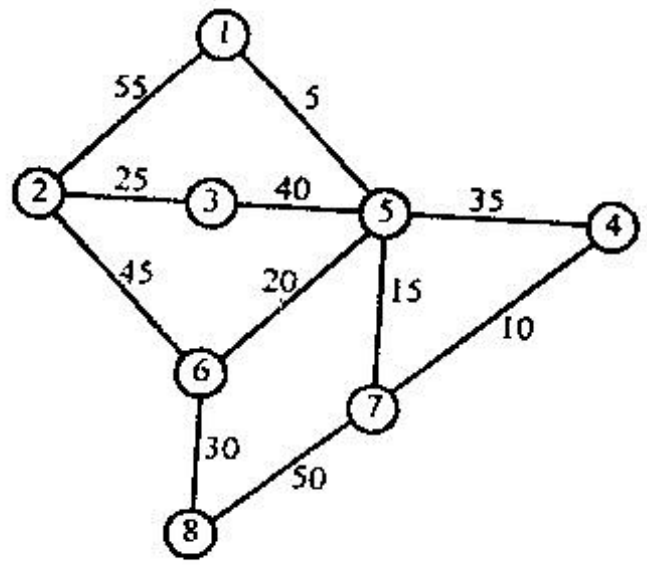
UNIT – I

1. Give asymptotic upper bound or lower bound on each of the following recurrences. Assume that T(n) is constant and make your bound as tight as possible. Justify your answer (any four).
   (i) $T(n) = 3T(n/2) + n \log n$ (ii) $T(n) = 5T(n/5) + n/n \log n$
   (iii) $T(n) = 4T(n/2) + n^2\sqrt{n}$
   (iv) $T(n) = 3T\left(\frac{n}{3}+5\right)+n/2$
   (v) $T(n) = T(n-2) + 2 \log n$ $(4 \times 4 = 16)$

OR

2. (a) Trace the Kruskal's algorithm to obtain minimum spanning tree from the graph. (10)



   (b) Illustrate the operation of heap on following array:
   A = <5, 13, 2, 25, 7, 17, 20, 8, 4> (6)

UNIT – II

3. (a) Define how Knapsack problem is solved by using dynamic programming approach?
   (b) Consider n = 3. $(w_1, w_2, w_3) = (2, 3, 3)$, $(p_1, p_2, p_3) = (1, 2, 4)$ and m = 6. Find optimal solution for given data. (6) (10)

OR

4. (a) X = <a, a, b, a, b>, Y = <b, a, b, b>. If Z is an LCS of X and Y, then find Z using dynamic programming.
   (b) Solve the TSP problem having the following cost matrix using branch and bound. (8)

	A	B	C	D
A	X	5	2	3
B	4	X	2	3
C	4	2	X	3
D	7	6	8	X

(8)

UNIT – III

5. Given the text

$T = <2, 3, 5, 9, 0, 2, 3, 1, 4, 1, 5, 2, 6, 7, 3, 9, 9, 2, 1>$

$P = <3, 1, 4, 1, 5>$

And modulo $q = 13$, $m = 5$

Choose the pattern matching with average case complexity and explain the search process. Justify the answer for choosing such algorithm. (5 + 8 + 3)

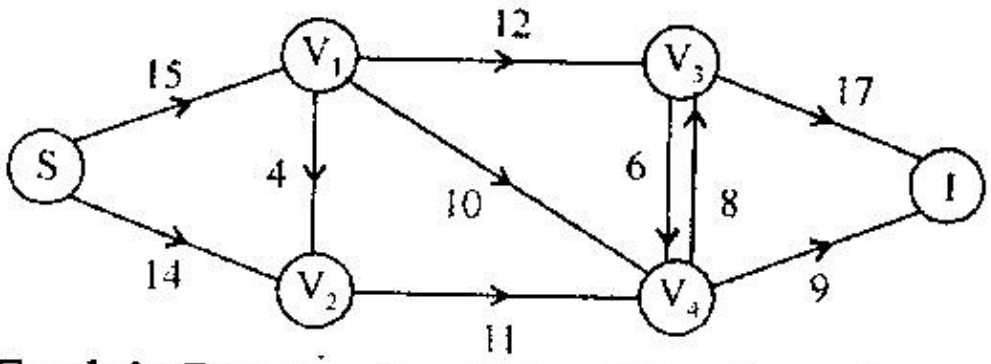
OR

6. (a) Write short note on the following:
   (i) Quadratic Assignment Problem.
   (ii) Bi-quadratic Assignment Problem. (4 × 2 = 8)

   (b) What is the use of prefix function in KMP string matching algorithm. Explain with example. (8)

UNIT – IV

7. (a) Define flow networks and solve the following flow network for maximum flow : (12)

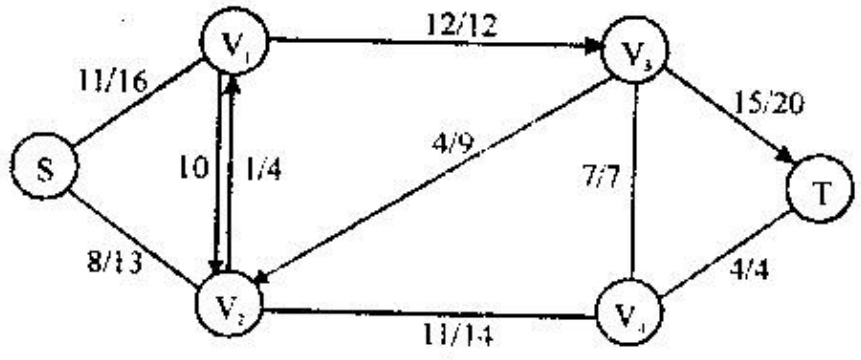


   (b) Explain Randomized algorithm for min-cut. (4)

OR

8. (a) Solve the randomized algorithm N – Queens problem. (8)

   (b) Show the formation of cuts, Augmentation path, Min-flow-max-cut in the following graph. (8)



UNIT – V

9. (a) Assuming 3 –CNF satisfiability problem to be NP- complete, prove clique problem is also NP – complete. (10)

   (b) Explain the Cook's theorem with suitable example. (6)

OR

10. (a) Show that TSP is NP complete. (8)

    (b) Explain vertex and set cover problem. (8)