1- General AI knowledge

1- F 2- T 3- F 4- T 5- F 6- F 7- F 8- T 9- T 10- T

11- T 12- F 13- T 14- F 15- F

2- Search Algorithms Concepts

a)

- States: The set of pairs of positions for Pacman and Ms. Pacman:

$$\{((x1, y1),(x2, y2)) \mid x1, x2, y1, y2 \in \{1, 2, \ldots, N\}\}$$

- Maximum size of state space: N^2 for both pacmen, hence N^4 total
- Maximum Branching factor: Each pacman has a choice of 5 actions, hence $5^2 = 25$ total
- GoalTest: isGoal((x1, y1),(x2, y2)) := $(x1 = x2) \wedge (y1 = y2)$

b) Manhattan distance between Pacman and Ms. Pacman DIVIDED BY 2 (since both take a step simultaneously)

c) BFS, UCS, A* (with a consistent and admissible heuristic), A* (with heuristic that returns zero for each state)

d) Answer: max(h1, h2), min(h1, h2), $(\alpha)h1 + (1 - \alpha)h2$, for $\alpha \in [0, 1]$

3- Comparing Search Strategies

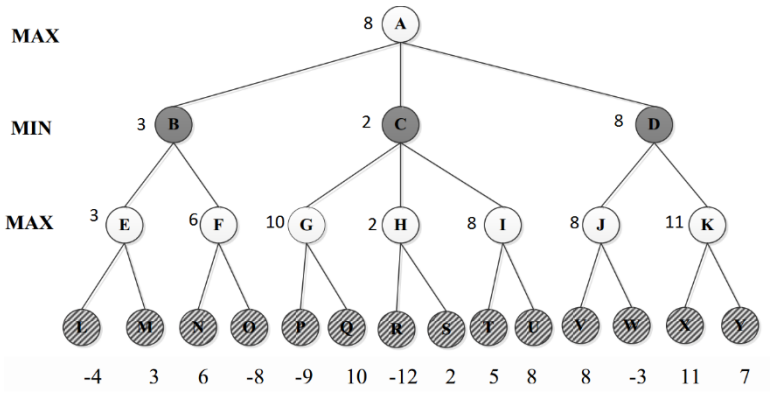
a) S , B , F , G1 Goal: G1

b) S , B , E , D , C , F , A , G2 Goal : G2

c) S , S , B , C , S , B , E , F , C , G1 Goal: G1

d) S , B , E , D , F , G2 Goal: G2

4- Game Playing



b) O , I, T , U , Y
c) Yes, the best order will be D , B , C .
Pruned nodes will be : Y , F , N , O , I , T , U

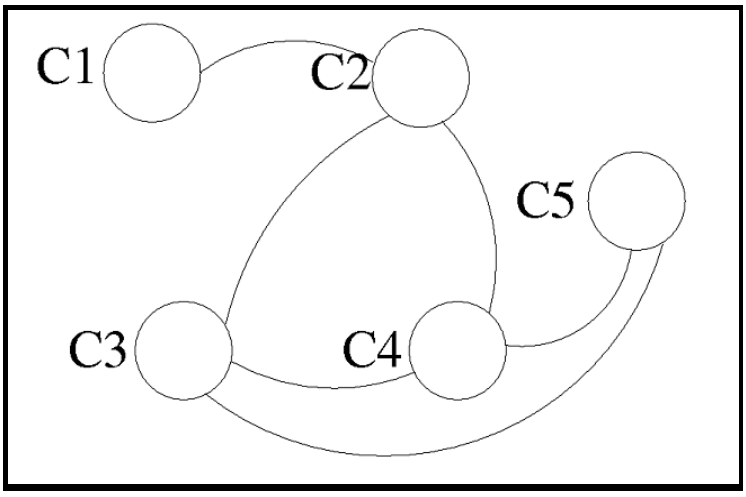
5- Constraint Satisfaction

Variable	Domain
C1	C
C2	BC
C3	ABC
C4	ABC
C5	BC

Constraints:

a) C1 ≠ C2, C2 ≠ C3, C3 ≠ C4, C4 ≠ C5, C2 ≠ C4, C3 ≠ C5.

b)



c)

Variable	Domain
C1	C
C2	B
C3	AC
C4	AC
C5	BC

d) C1 = C, C2 = B, C3 = C, C4 = A, C5 = B.

6- Local Search

a) $9^* \binom{9}{2} = \frac{9*9*8}{2}$

b) $(9!)^9$

c) Neighbors: $\binom{3}{2} + 2^* \binom{4}{2} + 4^* \binom{6}{2} + 2^* \binom{8}{2}$
Total space : 3! + 2*4! + 4*6! + 2*8!

d) Multiple solutions exist.
For each row, consider v(row) = "number of missing integers from that row" So for the example v(row1) =4 because 2,3,4,9 are missing. The h function is the sum of these values for each row. For goal states, every row should have all the 9 integers so the v for every row is 0 thus the h function is 0 too.

e) For the example state given, h is 4+ 3+ 3+ 4+3+4+3+3+3 = 30
In first column, we can swap 1 and 3 . The h function for the new state will be 28