National University of Computer and Emerging Sciences, Lahore Campus

Course:	Artificial Intelligence	Course Code:	CS401
Program:	BS(Computer Science)	Semester:	Spring 2017
Duration:	60 Min	Total Marks:	30
Paper Date:	21-2-2018	Weight	15%
Section:	D and E	Page(s):	4
Exam:	Mid 1	Reg. No(Sec)	----------( )
Instruction/Notes:	You can use rough sheet, but final working and answers should be on paper. You can use back side of paper as well.		

Question 1: (10)

a) Consider the state space given in figure. Traverse a graph using uniform cost (graph) search to reach from start state A to goal state C. At each step show which node is explored and changes in frontier and explored list. Also maintain parent and g(n) for each node.

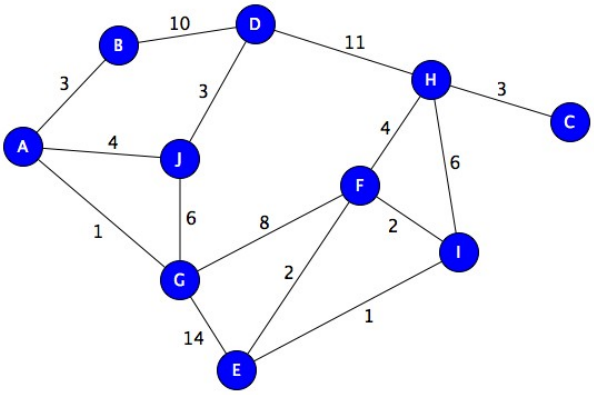

Figure 1 State Space

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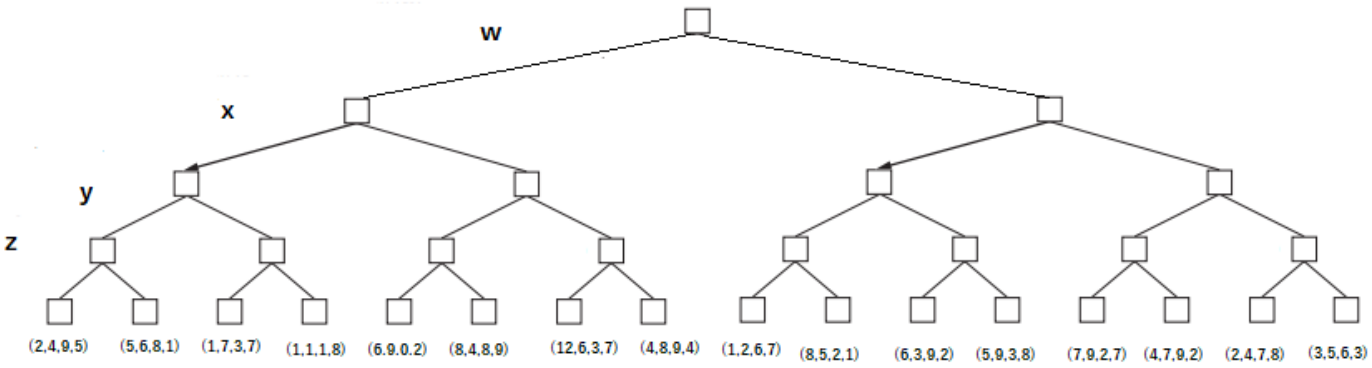
Question 3: (6 + 4)

a) Consider game tree of 4 player game (W, X, Y, Z). Terminal states show the Score of each player W, X, Y, Z . The game is played in partnership W and Y are partners, and X and Z partners. Each player is playing optimality and tries to maximize sum of its own and its partner's score. Partnership with highest score wins at the end of game. Find the node value of each node given in the tree. Which partners will win in the end of game if everyone plays optimally?



b) Write a recursive function to get node value for part (a).

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Question 4: (10)

Consider the following Genetic Algorithm setup for some hypothetical problem

Population size= 6
Chromosome: array of 8 bits
Fitness function is given as f (n) = number of 1's in chromosomes
Goal: Fitness>= 6
Selection: Rank selection
Cross over method: One point, from random point.
Mutation Rate: 0%
Update method= population → 6 best from (population union population)

We have generated 6 random chromosomes in initial population given in table 2.

1. Find the fitness of chromosomes in initial population and their selection probability.
2. Perform first iteration using the selection, cross over and mutation method given above and generated new population.
3. Which chromosomes will go as population in 2nd iteration?

**NOTE: You can use suppose a random number if you need one, just mention its value where you use it. Show all steps and working clearly.

Table 1: Initial Population

Chromosome 1	00001101
Chromosome 2	11000000
Chromosome 3	00000000
Chromosome 4	10101000
Chromosome 5	00111000
Chromosome 6	01000011