KING MONGKUT's UNIVERSITY OF TECHNOLOGY THONBURI
Computer Engineering Department
Mid-Term Examination

CPE 371 Artificial Intelligence — **CPE's Undergraduate Students**
CPE 640 Artificial Intelligence and Machine Learning — **CPE's Master Students**

Instructions

1. There are totally 4 questions.
2. Every questions have the same score point, please do them all.
3. Put your answers in the answer booklet.
4. Please read every question carefully before answer it.

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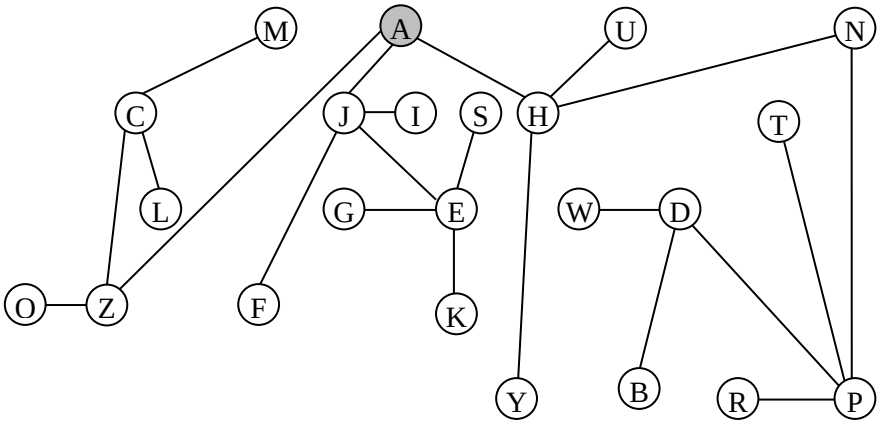
Instructor

This examination has been approved by the department of computer engineering.

Name _____ ID _____

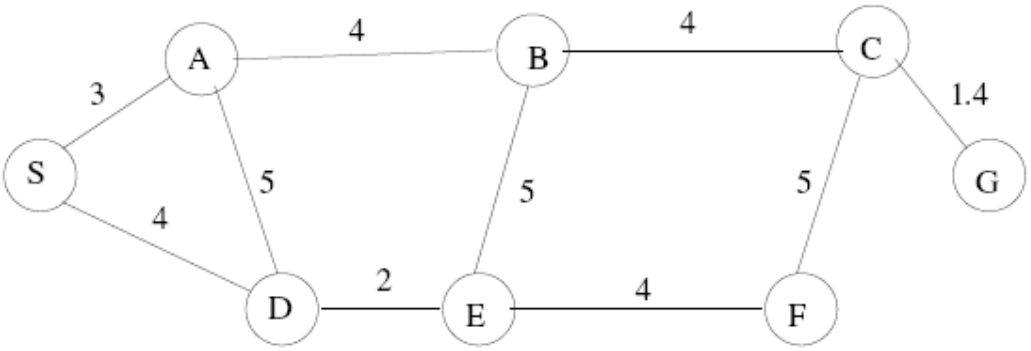
1. **Please describe the PEAS for a machine for "doing a paper TOFEL exam" activity.**

2. **Consider the complete search tree in the figure below:**



Let's make the start node is the A node. List the order in which all nodes in this tree are visited by following searches (*the children nodes are expanded by alphabetical order*):

a) breadth-first search
b) depth-first search
c) iterative deepening search



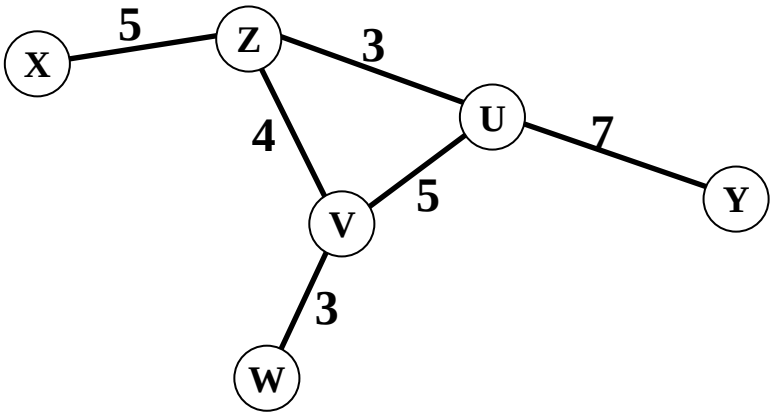
3. **Consider the above graph** that represents road connections between different cities. The weights on links represent driving distances between connected cities. Let S be the initial city and G the destination. (Note: using elimination of cyclic repeats)

a) Show how the uniform search tree works by giving an order in which nodes are expanded. Is the path found by the algorithm optimal? Is it complete?
b) Assume the following set of the straight line distances between G and other cities.

S	A	B	C	D	E	F
10	10	6	1.4	9	7	2

Show how the greedy search algorithm with the straight-line distance heuristic works. Is the path the algorithm finds optimal? Is it complete?

c) Show how the A* with the straight-line distance heuristic works. Is the path found optimal? Is it complete?



4. Consider the above graph where each node is a variable and an arc is labeled with a number from 2 to 8. Each variable can take on integer values from 1 to 10 (including 1 and 10). Each arc represents a constraint the two variables connected by the arc must satisfy. The constraint is that each variable must have the same value modulo the number on arc. For example, the arc connecting x, z with value 3 represents a constraint *x mod 3 = z mod 3*. This constraint can be satisfied by assignments (*x=4, z=1*), or (*x=5, z=2*), or (*x=7, z=1*). In addition, all variables are distinctively different (meaning Alldiff(x,y,z,w,u,v)).

- ***Find a possible solution that legally assigns values of all variables*** (even though it may appear that there are many possible answers). Please use *Forward Checking* with *MRV* heuristic to solve it. Be sure to show all your works.