Q1: Consider the search space below, where S is the start node and G1 and G2 are goal nodes. Arcs are labeled with the value of a cost function (the number gives the cost of traversing the arc). Above each node is the value of a heuristic function.

![Search Space Diagram]

Indicate which goal state is reached first using: (Choose only one algorithm)

1. Best First Search Algorithm.

Q2: Write prolog program to perform the following: (Choose only two)

1. Define a predicate fact_up_list(L, K) which, given a list of integers L, returns a list of integers in which each element is the factorial of all the elements in L up to the same position. Example: ?- fact_up_list([1,2,3,4], K) K = [1,2,6,24].

2. Save 20 cars into database using a predicate called db_car(CarName, CarModel, CarColor), then count how many red cars with 2011 model.

3. Finds any path between given initial and goal states by using backward chaining.

Q3: (A) Draw Semantic Net for the following text:
"Ali told Maha that Ahmed cannot go to college tomorrow, also Maha’s brother will give the blue small sheet to Ali to send it to Amjd at night today. Ali is a brave and honor man".

(B) Write prolog program to execute the Depth First Search algorithm then save the output path into database called db_path().
Q4: Suppose you have the following rules and facts:

likes (ahmed, S):-student_of (S, ahmed).
student_of (S, T):- studies (S, C), teaches (T, C).
teaches (ahmed, prolog).

Prove likes (ahmed, ali) using Resolution Technique. (10 Marks)

Q5: Consider the following 8-Puzzle problem to give the following requirements:

<table>
<thead>
<tr>
<th>2</th>
<th>8</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Start state

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

Goal state

1. Draw the search state space of the problem.
2. Find the goal state using Breadth First Search.
3. What is the data structure of the 8-puzzle? (10 Marks)

Q6: (A) Suppose you have the following pattern in sentence from human and the machine (computer) response:

..........I am fine..................How are you?
..........My friend................ What your friend work?
..........I hope .............. Is your hope only this time?

Write a complete prolog program to perform the text recognition task according to the above dialogue.

(B) Compare between the following and give an example for each one:

(Choose only two).

1. Findall() predicate and fail.
2. Consult() and save() predicates.
3. Intelligent systems and Expert systems. (10 Marks)

**BEST WISHES**