**Enrollment No: _____**

**GANPAT UNIVERSITY**
**B. TECH (COMPUTER ENGINEERING/INFORMATION TECHNOLOGY) SEM - VII**
**REGULAR EXAMINATION NOV - DEC 2020**
**2CE702/2IT702: ARTIFICIAL INTELLIGENCE**

**Time: 1.5 Hours** **Total Marks: 30**

**Q-1** Using the BFS and DFS method, generate the search trees for the given water jug problem having two jugs capacity as 8 liter and 5 liter. There is a pump from which you can pour unlimited water into the jug. There are no any measuring marks given on the jug. How will you exactly 4 liter of water in the 8 liter jug. Based on the generated search tree discuss the advantages and disadvantages of BFS and DFS for the given water jug problem. **[5]**

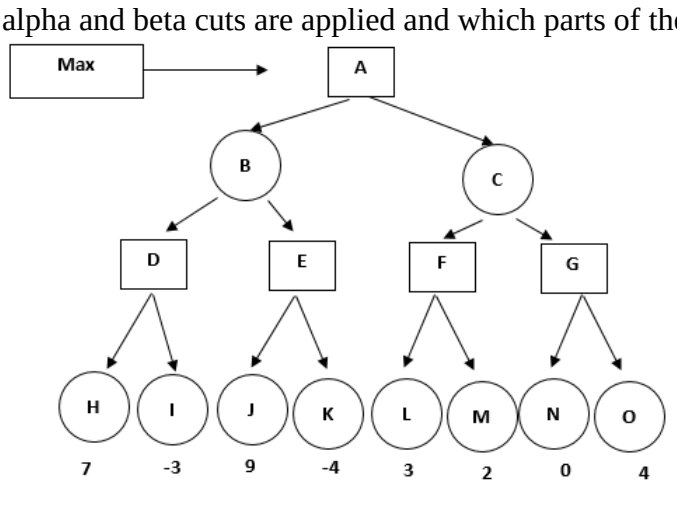
**Q-2** For the 8-puzzle problem, given initial state as **[5]**

| | | |
|---|---|---|
| 3 | 5 | 4 |
| 7 | 6 | 8 |
| 1 | 2 | |

(i) Using the Simple Hill climbing method, show the search tree that would be built down to level4.
(ii) Using Best First search method, show the search tree that would be built down to level3.
Note: assume level zero is the root of the tree, Apply heuristic function as Manhattan distance.

**Q-3** What do you mean by constraint satisfaction? List out the rules for cryptarithmetic puzzles and solve the given puzzle: TWO+TWO=FOUR. **[5]**

**Q-4** Apply the alpha-beta pruning method on the given search tree with its calculation and show the search tree that would be built by this method. Make sure that you have to show where the alpha and beta cuts are applied and which parts of the search tree are pruned as a result. **[5]**




**Q-5** A Genetic Algorithm uses chromosomes of the form x=abcdefgh with a fixed length of eight genes. Here a, b, c, d, e, f, g, h are genes of chromosomes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: **[6]**

$$f(x) = (a+b)-(c+d)+(e+f)-(g+h)$$

and initial population consists of four individuals with the following chromosomes:

x1 = 87126541
x2 = 23926601
x3 = 35321215
x4 = 41052904

**Give the answer of following questions:**
(i) Write down the Sorting order of Chromosomes according to fitness value in descending order (from high fittest value to least fit value).
(ii) Perform uniform crossover at positions a, d and f of parents on the following pair:

x1 & x4 will generate offspring O1 & O2
x2 & x3 will generate offspring O3 & O4

(iii) Perform inversion mutation on generated offspring from above question at starting position d and ending position h.
(iv) The new population consists of the four offspring individuals received by the above question. Evaluate the fitness of the new population. Has the overall fitness improved?
(v) After observing Q. i to iv, which steps of Genetic algorithm are not included in above Q. i to iv?

**Q-6** **[4]**

- Raj likes all kinds of food.
- Apples are food.
- Anything anyone eats and isn't killed by is food.
- Sachin eats peanuts and is still alive.
- Vinod eats everything Sachin eats.

Now, attempt following:
i. Translate these sentences into formulas in predicate logic.
ii. Translate predicate logic into CNF.
iii. Use resolution to answer the question, "What food does Vinod eat?"
iv. Draw a Resolution Tree to answer the question, "What food does Vinod eat?"

**---------- End of Paper ----------**