GANPAT UNIVERSITY
B. TECH (CE/IT/CE-AI) SEM- VI REGULAR EXAMINATION– APRIL-JUNE 2022
2CEIT602: ARTIFICIAL INTELLIGENCE

TIME: 3 HRS   **TOTAL MARKS: 60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
           (2) Figures on right indicate marks.
           (3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q. 1 **[A]** What is Best First Search Technique? What is OPEN and CLOSED list in Best First Search? Explain Best First Search in detail with suitable example. **(04)**

[B] Why do we use Mini-Max Search Procedure? What are the disadvantages of Mini-Max Search Procedure and how can we recover it using alpha beta pruning? Discuss it with following example. **(06)**

OR

Q. 1 **[A]** Discuss the basic components of Biological Neural Network in detail with diagram and also discuss the similarity of Biological Neural Network components with Artificial Neural Network. **(05)**

[B] Suppose you tracked the weather conditions for 14 days and based on the weather conditions, you decided whether to play golf or not play golf. **(05)**

Outlook	Temperature	Humidity	Windy	Play golf?
sunny	hot	high	false	No
sunny	hot	high	true	No
overcast	hot	high	false	Yes
rainy	mild	high	false	Yes
rainy	cool	normal	false	Yes
rainy	cool	normal	true	No
overcast	cool	normal	true	Yes
sunny	mild	high	false	No
sunny	cool	normal	false	Yes
rainy	mild	normal	false	Yes
sunny	mild	normal	true	Yes
overcast	mild	high	true	Yes
overcast	hot	normal	false	Yes
rainy	mild	high	true	No

Consider the given record X= {Outlook: sunny, Temperature: mild, Humidity: normal, Windy: false}. Apply the Naïve Bayes' Theorem and find the weather tuple X will able to play golf or not?

Q.2 **[A]** What is Hill Climbing? Discuss the reasons when hill climbing is fails. What are the solutions to overcome the problems of hill climbing? Explain it with Block World Problem. **(05)**

[B] What is Fuzzy Logic? How does it differ from Crisp Logic? Explain at least four basic operations of Fuzzy Set. **(05)**

OR

Q.2 **[A]** In the following image, the rounded circle is representing a node, an initial node is A and **(05)** Goal node is J, heuristic value is written inside the node and path cost value is written on the edge between two nodes. Reach the goal node J from Initial node A by using A* algorithm by writing down an open and closed list for each & every step. Write down path and path cost.
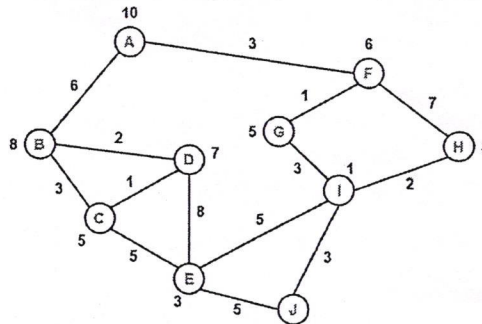
[B] Explain Marginal distribution, Joint distribution, Conditional probability distribution and **(05)** answer the followings:
  (i)   The probability that a card drawn is red.
  (ii) The probability that a card is a four and red.
  (iii) Given that you drew a red card, what's the probability that it's a four.

Q.3 **[A]** Explain exploration and exploitation in Reinforcement Learning in detail. **(05)**

[B] You have given two jugs having the capacity of 16-liter and 7-liter. There is a pump from **(05)** which you can pour unlimited water into the jug. There are no any measuring marks given on the jug. How will you get exactly 8-liter of water in the 16-liter jug in minimum steps? Also write the rules of the given problem.

SECTION: II

Q.4 **[A]** What do you mean by Hidden Markov Model? Explain it in detail with example. **(05)**

[B] What is Perceptron? Why we use Multi-Layer Perceptron? Explain Multi-Layer Perceptron **(05)** for XOR function.

OR

Q.4 **[A]** Draw Genetic algorithm flowchart and explain all Genetic operators with example. **(05)**

[B] Explain the production system inference cycle with diagram. **(05)**

Q.5 **[A]** Consider the problem of finding the shortest route through several cities, such that each city **(05)** is visited only once and in the end return to the starting city (the Travelling Salesman problem). Suppose that in order to solve this problem we use a genetic algorithm, in which genes represent links between pairs of cities. For example, a link between London and Paris is represented by a single gene 'LP'. Let also assume that the direction in which we travel is not important, so that LP = PL.
  a) How many genes will be used in a chromosome of each individual if the number of cities is 10?
  b) How many genes will be in the alphabet of the algorithm? (Here, alphabet represents all possible genes)

[B] Explain Rule based Expert System architecture. **(05)**

OR

Q.5 **[A]** A Genetic Algorithm uses chromosomes of the form x=abcdefgh with a fixed length of eight **(05)** 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:

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

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

$$x1 = 57126541$$
$$x2 = 23926601$$
$$x3 = 35321215$$
$$x4 = 71052904$$

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:

$$x1 \ \& \ x4 \text{ will generate offspring O1 \& O2}$$
$$x2 \ \& \ x3 \text{ will generate offspring O3 \& O4}$$

(iii) Perform inversion mutation on generated offspring from above question at starting position d and ending position h.

[B] What is Policy function? Explain stationary and non-stationary policy. **(05)**

Q.6 [A] Consider below statements as knowledge base. Based on the knowledge base above, prove **(05)** formally that "there exists some AI student who loves Star Wars" by using resolution and unification.

1. Star Trek, Star Wars and The Matrix are science fiction movies.
2. Every AI student loves Star Trek or Star Wars.
3. Some AI students do not love Star Trek.
4. All AI students who love Star Trek also love The Matrix.
5. Every AI student loves some science fiction movie.
6. No science fiction movie is loved by all AI students.
7. There is an AI student who loves all science fiction movies.

[B] Explain all equations of Q functions for infinite horizon. What is policy and how can we find **(05)** optimal policy by using Q Function.

--END OF PAPER--