National University of Computer & Emerging Sciences, Karachi
Spring-2022 CS-Department
Midterm II
April 19, 2022, Slot: 08:30AM – 09:30AM

Course Code: CS AI2002	Course Name: Artificial Intelligence
Instructor Name:	Dr Muhammad Farrukh / Dr Fahad / Saeeda Kanwal / Waheed Ahmed/ Sohail Afzal
Student Roll No:	Section No:

- Return the question paper.
- Read each question completely before answering it. There are **4 questions and 2 pages.**
- In case of any ambiguity, you may make assumption. But your assumption should not contradict with any statement in the question paper.
- All the answers must be solved according to the sequence given in the question paper.
- Be specific, to the point while coding, logic should be properly commented, and illustrate with diagram where necessary.

Time: **60 minutes.** **Max Marks**: **50 points**

Question No. 1 **CLO3** **[Time: 10 Min] [Marks:(10)]**

Q1. In a given class, each student is being evaluated on the basis of major attributes namely Result, Attendance, Discipline, and Co-curriculum activities where 3 binary digits are taken for each attribute. The best student is represented by 111111111111. Use genetic algorithm, for selection of the best student by starting from first four students, for three iterations. Use one-point crossover through the center, while performing 200 mutations in 100 generations.

Question No. 2 **CLO3 [Time: 20 Min] [Marks: (15)]**

Your task is to schedule CS department classes that meet Mondays, Wednesdays and Fridays. There are 5 classes that meet on these days and 3 professors who will be teaching these classes. You are constrained by the fact that each professor can only teach one class at a time.
The classes are:

- Class 1 - Intro to Programming: meets from 8:00-9:00am
- Class 2 - Intro to Artificial Intelligence: meets from 8:30-9:30am
- Class 3 – Information Retrieval: meets from 9:00-10:00am
- Class 4 – Data Science: meets from 9:30-10:30am
- Class 5 – Computer Networks: meets from 10:00-11:00am

The professors are:

- Professor A, who is available to teach Classes 3 and 4.
- Professor B, who is available to teach Classes 2, 3, 4, and 5.
- Professor C, who is available to teach Classes 1, 2, 3, 4, 5.

a. Formulate this problem as a CSP problem in which there is one variable per class, stating the domains, and constraints (write unary and binary constraints) **(5 Marks)**
b. Draw the constraint graph associated with your CSP. **(2 Marks)**
c. Show the domains of the variables after running arc-consistency on this initial graph (after having already enforced any unary constraints). **(5 Marks)**
d. Give one solution to this CSP. **(3 Marks)**

Question No. 3	**CLO3 [Time: 20 Min] [Marks: 15 (10+5)]**

Part A) Under the Flag of FAST NUCES- IEEE an AI-Enabled Tech Exhibition 2022 project exhibition has been organized. This exhibition aims to provide students' work with broader visibility and make their work accessible and available for the interested people. With the policy of having 3 members in group and zero tolerance for plagiarism. If found it will lead to Disciplinary Action. So, you and two of your friends decided to participate (Consider yourself =X, Friend1=Y, Friend2= Z). X and Y sincerely did hard work, and both cooperated with each other to analyze and solve the occurring challenges. But Z always considered himself a mastermind and never participated in group activity. But suddenly he got stuck and copy pasted the code from internet without bringing this thing in his friends' knowledge.

During evaluation it was found that a particular chunk of code has been copied and now three of them will be called for DC. Where either each participant will Confess or Deny. As X and Y always worked as a team so they decided to give priority to co-operate (i.e. Confess or Deny) over opposite decision(X confess and Y Deny or vice versa).But always aiming for Z to Confess because he did wrong so only he will be liable for breaking rule. In case if in any circumstances both must take opposite decision still their aim would be same for Z to confess. Meanwhile Z realized that he did wrong and try to make sure his friends won't be suffering furthermore due to him.

So, using Min max draw a Game tree and Identify what decision should be taken by Z?

(Note: Tuple utilities to be assigned as X, Y, Z)

Part B) A game is played between max and min. Draw a tree considering MIN as a first player and branching factor is 2. Given terminal values below, show backed up values, best decision available at the root and branches that will get pruned (explain why they are getting pruned if any)?

5,6,4,10,7,8,4,5

Question No. 4	**CLO3 [Time: 10 Min] [Marks: 10]**

Covid19 has been quite devastating and has changed the living standard of our life. Covid19 test has become a mandatory requirement for traveling, work, educations, and other things. Under such a situation, the Covid19 test results are quite accurate, but there are some chances of getting the wrong result. Consider an ABC lab diagnostic test that has 99% accuracy, and 60% of all people have been affected with Covid19. If a person named Hadi tests positive, what is the probability that he has the Covid19?

Good Luck!