Cse352 AI
Homework 4 (10pts)
Genetic Algorithm

There is only one Problem.

PROBLEM (10pts)

Here is a small set of data:

TABLE 1

Income	Student	Rating
high	No	Fair
low	No	Excellent
high	yes	Fair
medium	No	Fair
low	Yes	Fair
high	no	Excellent
low	Yes	Excellent
medium	No	Fair
low	no	Fair
medium	Yes	Fair

1. RE-WRITE TABLE 1 as **TABLE 2 with the following set of attributes**
 A1: Income= high,   A2: Income=medium, A3: Income=low
A4: Student=No, A5: Student=Yes,   A6: Rating=Fair,
 A7; Rating= Excellent
Observe that now values of   all attributes A1 – A7
 are numbers **0, 1**

TABLE 2   IS:

A1	A2	A3	A4	A5	A6	A7

2. WRITE a set of **Binary Encoding Chromosomes**
 representing the original data given by **TABLE 1** as your
DATA BASE of Chromosomes
DB= { Ch1, Ch2, …… Ch10 } =

**3. CHOOSE randomly   5 Chromosomes from the DB as your
INITIAL POPULATION IP= { Ch1, Ch2, …… Ch5 }**

**4. CREATE TWO GENARATIONS G1, G2 of your INITIAL
POPULATION IP using GA** operators of **Selection,
Single Point Crossover, Mutation** for
Single Point Crossover and **Fitness Function** defined
below.
Definition1

Given a chromosome **Ch= c1c2c3c4 c5c6 c7**
use as a **cross point** a point after **c4**, i.e. use the
following **single crosspoint**
$$c1,c2,c3,c4, \mid c5,c6, c7$$

Definition 2
We **define** a **fitness function F** as follows:

For any chromosome **Ch =c1c2c3c4c5c6c7** we put
F(c1c2c3c4c5c6c7) = F1(c1c2c3) + F2(c4c5) + F2(c6c7)
Where:
  F1(c1,c2,c3) = 1 when **only ONE 1** appears in the sequence
c1c2c3 and **F1(c1c2c3) = 0** **otherwise**

F2(c4c5) = 1 when **only ONE 1** appears in the sequence **c4c5**
and **F2(c4c5) = 0** **otherwise**

F2(c6c7) = 1 when **only ONE 1** appears in the sequence **c6c7**
and **F2(c6c7) = 0** otherwise

EXAMPLE:
F(1100100) = F1(110) + F2(01) + F2(00) = 0 +1 +0= **1**
F(1000101) = F1(100) + F2(01) + F2(01) = 1 +1 +1 = **3**
F(1011001) = F1(101) + F2(10) + F2(01) = 0 +1 +1 = **2**
F(1010 001) = F1(101) + F2(00) + F2(11) = 0 +0 +0 = **0**

GOAL of the **GA** is to **find** a **POPULATION P** with
MAXIMUM value of the **fitness function F** for **all**
chromosomes in **P**

5. Write DATA TABLE **DG2** representing your second
   generation, i.e. the **Generation G2**
The **DG2** must have a format of the **initial TABLE 1**