1. Answer questions 1a – 1c using ONLY the data provided in the following relation (32 points).

<table>
<thead>
<tr>
<th>customer#</th>
<th>cust_name</th>
<th>cust_addr</th>
<th>City</th>
<th>project#</th>
<th>start_date</th>
<th>estimate_cost</th>
<th>zip_code</th>
</tr>
</thead>
<tbody>
<tr>
<td>c_123</td>
<td>XYZ Co.</td>
<td>541 Maple St.</td>
<td>New York</td>
<td>10</td>
<td>01/20/99</td>
<td>$20,000</td>
<td>30899</td>
</tr>
<tr>
<td>c_123</td>
<td>XYZ Co.</td>
<td>541 Maple St.</td>
<td>New York</td>
<td>20</td>
<td>02/18/96</td>
<td>$14,300</td>
<td>30899</td>
</tr>
<tr>
<td>c_998</td>
<td>ABC Co.</td>
<td>321 Oak St.</td>
<td>New York</td>
<td>10</td>
<td>01/20/99</td>
<td>$5,000</td>
<td>30899</td>
</tr>
<tr>
<td>c_998</td>
<td>ABC Co.</td>
<td>321 Oak St.</td>
<td>New York</td>
<td>40</td>
<td>04/15/97</td>
<td>$3,200</td>
<td>30899</td>
</tr>
<tr>
<td>c_092</td>
<td>Hyatt Inc.</td>
<td>3011 L St.</td>
<td>New York</td>
<td>2</td>
<td>05/18/97</td>
<td>$5,000</td>
<td>20223</td>
</tr>
<tr>
<td>c_092</td>
<td>Hyatt Inc.</td>
<td>3011 L St.</td>
<td>New York</td>
<td>30</td>
<td>09/15/00</td>
<td>$5,000</td>
<td>20223</td>
</tr>
<tr>
<td>c_567</td>
<td>Norble Inc.</td>
<td>450 L. St.</td>
<td>New York</td>
<td>20</td>
<td>02/18/96</td>
<td>$18,567</td>
<td>20223</td>
</tr>
<tr>
<td>c_085</td>
<td>Ynot, Co.</td>
<td>SweetAir Dr</td>
<td>New York</td>
<td>1</td>
<td>04/03/01</td>
<td>$24,500</td>
<td>65964</td>
</tr>
<tr>
<td>c_112</td>
<td>Hope Inc.</td>
<td>900 High St.</td>
<td>New York</td>
<td>50</td>
<td>12/18/97</td>
<td>$9,000</td>
<td>45666</td>
</tr>
<tr>
<td>C_787</td>
<td>Widget Inc.</td>
<td>541 Maple St.</td>
<td>Chicago</td>
<td>1</td>
<td>04/03/01</td>
<td>$24,500</td>
<td>12345</td>
</tr>
</tbody>
</table>

1a) Answer YES or NO as to whether the functional dependency holds (check the appropriate box).

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td>YES</td>
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</tbody>
</table>

1b) Find one candidate key in the table using the closure process. Be sure to show Armstrong’s Axioms and the steps you take in finding the candidate key.

1c) What normal form is this table currently in? (circle one) 1NF  2NF  3NF  BCNF
2. Given the following tables, answer questions 2a – 2e (48 points)

CREATE TABLE EMPLOYEE (  
EMPLOYEE_ID    VARCHAR2(8) NOT NULL,  
FIRST_NAME VARCHAR2(15)  NOT NULL,  
LAST_NAME VARCHAR2(15)  NOT NULL,  
LOCATION CHAR(3))

CREATE TABLE PC (  
PC_ID  CHAR(5)  NOT NULL,  
PC_BRAND VARCHAR2(10),  
PC_MODEL  VARCHAR2 (20),  
PC_PROCESSOR VARCHAR2(10),  
PC_CLOCK CHAR(3),  
PC_MEMORY NUMBER,  
PC_HD1_SIZE NUMBER,  
PC_HD1_FREE NUMBER,  
PC_TYPE_FLAG CHAR(1) NOT NULL)

CREATE TABLE DEPARTMENT (  
DEPARTMENT_ID NUMBER NOT NULL,  
DEPARTMENT_NAME  VARCHAR2(15),  
BUILDING  VARCHAR2(10))

CREATE TABLE EMP_COMPUTER (  
ASSIGN_NUMBER  NUMBER NOT NULL,  
EMPLOYEE_ID          VARCHAR2(8) NOT NULL,  
PC_ID   CHAR(5)  NOT NULL,  
PERIPHERAL_ID  CHAR(5) NOT NULL,  
DATE_ASSIGNED DATE,  
DEPARTMENT_ID NUMBER NOT NULL)

CREATE TABLE PC_TYPE_FLAG (  
PC_TYPE_FLAG  CHAR(1) NOT NULL,  
PC_TYPE_DESCRIPTION VARCHAR2(10))

CREATE TABLE PERIPHERAL (  
PERIPHERAL_ID  CHAR(5) NOT NULL,  
PERIPHERAL_TYPE_ID  NUMBER,  
PERIPHERAL_BRAND VARCHAR2(10),  
PERIPHERAL_MODEL VARCHAR2(15))

CREATE TABLE PERIPHERAL_TYPE (  
PERIPHERAL_TYPE_ID    NUMBER,  
PERIPHERAL_TYPE_DESCRIPTION  VARCHAR2(20)
)

2a) Produce an entity-relationship diagram representing the conceptual schema of these physical tables. Be sure to identify the primary and foreign keys in each table.

2b) Are any of the tables union compatible? Why or why not?
2c) Write the SQL for the following query:
List all of the computer peripheral descriptions for Tom Jones when he worked in the Marketing department.

2d) How would you optimize the performance of this query using indexes in order to get a fast response?

2e) Write the syntax to create a view that would list all the computers and peripherals used in a department.

3. Given the following table: (20 points)
Table1 (PetID,pet_name,PetOwnerSS#,DateofBirth,OwnerLastName,OwnerPhone#)
a) What normal form is the table currently in? Why?

b) Normalize the table to third normal form.