1. The computer science department has three entity sets instructors(i\_id, name, salary), courses(course\_id, course\_title, credit\_hours) and reference\_books(book\_id, book\_title, first\_author).

a. Draw an ER diagram for these entity sets. Please note that each course must have at least one reference book. [ 15 points]

|  |
| --- |
| **Instructors** |
| I\_id |
| Name |
| salary |

|  |
| --- |
| **Course** |
| Course\_id |
| Course\_title |
| Credit\_hours |

Instructor-course

course-reference-book

|  |
| --- |
| **Reference\_books** |
| Book\_id |
| Book\_title |
| First\_author |

Instructor-Reference\_book

All relations are many to many, except for course-Reference\_book which must have at least one book.

|  |
| --- |
| **Reference\_books** |
| Book\_id |
| Book\_title |
| First\_author |

b. Convert the ER diagram to non-redundant relation schemas. [ 10 points]

|  |
| --- |
| **Instructors** |
| I\_id |
| Name |
| salary |

|  |
| --- |
| **Course** |
| Course\_id |
| Course\_title |
| Credit\_hours |

|  |
| --- |
| **Course-Instructor** |
| Course\_id |
| I\_id |

|  |
| --- |
| **Instructor-book** |
| I\_id |
| Book\_id |

|  |
| --- |
| **Course-book** |
| Course\_id |
| Book\_id |

2. For an E-commerce system, you want to store information about the customers, products, the orders, and the customer comments/feedback about each product.

a. Model the database using ER diagram [ 25 points]

|  |
| --- |
| **Customer** |
| C\_id |
| Name |
| Address |
| Phone |

|  |
| --- |
| **Product** |
| P\_id |
| Name |
| Price |
| Quanity |

|  |
| --- |
| **Order** |
| O\_id |
| Shipping\_date |
| feedback |

b. Convert the ER diagram to non-redundant relation schemas. [ 10 points]

|  |
| --- |
| **Customer** |
| C\_id |
| Name |
| Address |
| Phone |

|  |
| --- |
| **Product** |
| P\_id |
| Name |
| Price |
| Quanity |

|  |
| --- |
| **Customer\_Product** |
| C\_id |
| P\_id |

|  |
| --- |
| **Customer-order** |
| C\_id |
| O\_id |

|  |
| --- |
| **Product-order** |
| P\_id |
| O\_id |

|  |
| --- |
| **Order** |
| O\_id |
| Shipping\_date |
| Feedback |

3. For a hospital, we want to store information about patients, doctors. We also would like to keep records of various tests conducted for each patient.

a. Model the database using ER diagram [ 25 points]

|  |
| --- |
| **Doctor** |
| D\_id |
| Name |
| Department |
| Salary |

|  |
| --- |
| Patient |
| P\_id |
| Name |
| Address |
| Phone |

|  |
| --- |
| **Test** |
| T\_date |
| Results |
| Type |

b. Convert the ER diagram to non-redundant relation schemas. [ 15 points]

|  |
| --- |
| **Doctor-Patient** |
| D\_id |
| P\_id |

|  |
| --- |
| **Doctor** |
| D\_id |
| Name |
| Department |
| Salary |

|  |
| --- |
| **Patient** |
| P\_id |
| Name |
| Address |
| Phone |

|  |
| --- |
| **Test** |
| T\_date |
| Results |
| Type |

|  |
| --- |
| **Test** |
| T\_date |
| Results |
| Type |

|  |
| --- |
| **Patient-Test** |
| P\_id |
| T\_date |
| Type |

|  |
| --- |
| **Doctor-Test** |
| D\_id |
| T\_date |
| Type |

|  |
| --- |
| **Test** |
| T\_date |
| Results |
| Type |