Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

المملكـة العربيـة السعوديـة
الـهيئـــة الوطنيـــة للتقويــم
والاعـتـمـــاد الأكـاديـمـــي

Solution Final Exam:

King Saud University

College of Computer and Information Sciences
Computer Science Department

Course Code:	**CSC 342**
Course Title:	**Software Engineering**
Semester:	**Spring 2016**
Exercises Cover Sheet:	**Solution Final Exam** **3 hours**

Student Name: …………………………………………………

Student ID: …………………………………………………

Department Name: …………………………………………………

Tick the Relevant		Computer Science B.Sc. Program ABET Student Outcomes	NCAAA Outcomes	Question No. Relevant Is Hyperlinked	Covering %
	a)	**Apply knowledge of computing and mathematics appropriate to the discipline;**	1.1	----	-----
√	b)	**Analyze a problem, and identify and define the computing requirements appropriate to its solution**	2.1	Ex. 1-2	**28.75%**
√	c)	**Design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;**	2.2	Ex. 6-7	**18.75%**
√	d)	**Function effectively on teams to accomplish a common goal;**	3.1	-----	------
√	e)	**Understanding of professional, ethical, legal, security, and social issues and responsibilities;**	1.2 – 3.2	----	-----
	f)	**Communicate effectively with a range of audiences;**	4.1	----	-----
	g)	**Analyze the local and global impact of computing on individuals, organizations and society;**	2.3	----	----
	h)	**Recognition of the need for, and an ability to engage in, continuing professional development;**	2.4	-----	---

Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

المملكــة العربيــة السعوديــة
الهيئــة الوطنيــة للتقويــم
والاعـتـمــاد الأكـاديـمــي

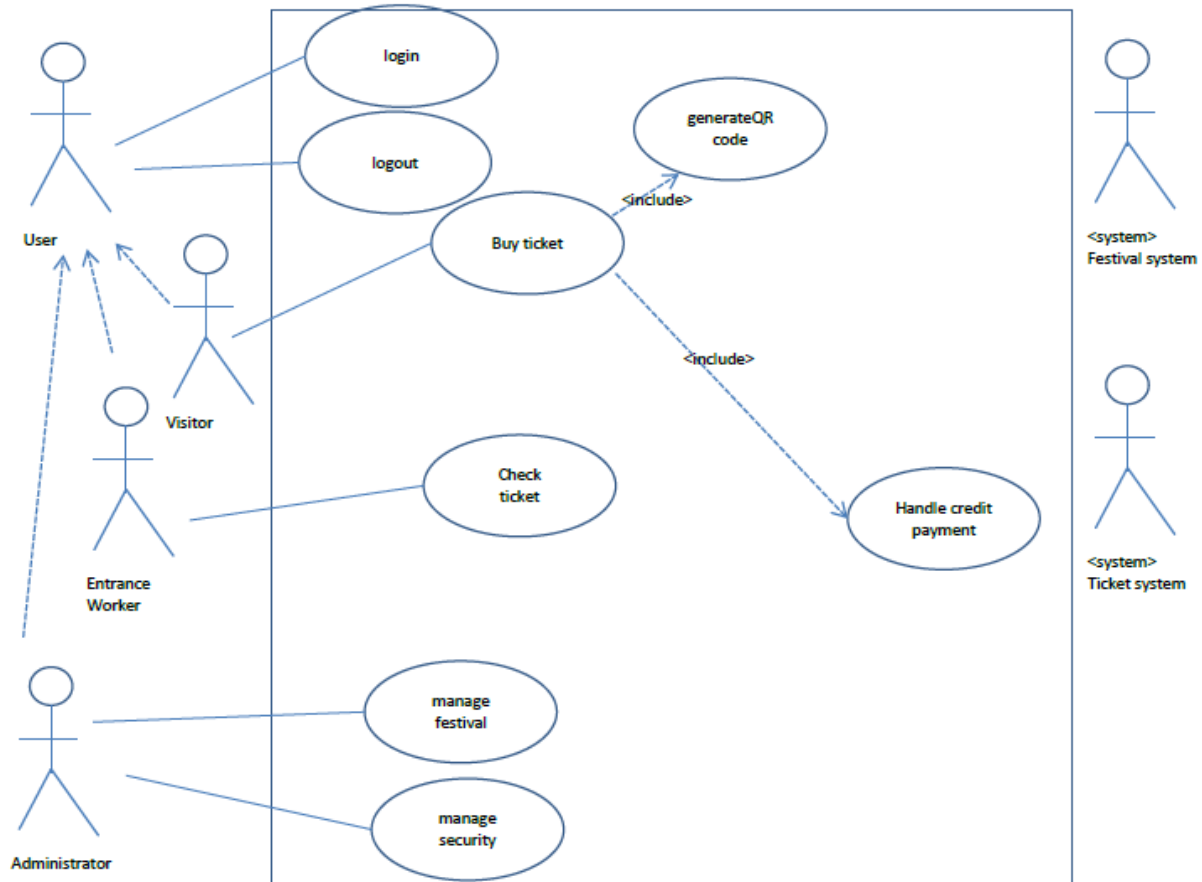|				
√	i) **Use current techniques, skills, and tools necessary for computing practices.**	1.3	Ex. 5	**18.75%**
	j) **Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;**	1.4	-----	**-----**
√	k) **Apply design and development principles in the construction of software systems of varying complexity;**	1.5	Ex. 3-4	**33.75%**

This exam comprises 7 exercises. Make sure you read each exercise carefully before attempting an answer. Be sure to clearly indicate your final answer for each exercise. Also, be sure to state any assumptions that you are making in your answers.

Good luck!

Exercise 1: *(Requirement Analysis)* *(11 points)*

Company X will develop a Circus ticket system (CTS) to be used to manage tickets and access to circus in Riyadh. The system includes a server computer and software to manage the operations of the system. The system provides a mobile interface to enable circus visitors to buy tickets. Moreover the system provides a mobile interface to enable festival personnel to check tickets at the entrance. Last, the system provides a web based interface for administration functions, such as declaration of new circus and statistics generation. The most basic functions are to handle ticket sales and to check tickets at entrance. When a visitor wants to buy a ticket, he logs in the system, the CTS starts a transaction, checks that there are enough available tickets for the given circus. When the sale transaction is over, the visitor can pay in cash or credit card. After the payment is successful, the visitor gets a Quick Response (QR) code sent to his mobile. Only credit card payment is supported. Only mobile based sales are supported. When a visitor arrives at a circus, the circus worker in charge uses his mobile to scan the QR code of the visitor, then CTS will retrieve the name of the visitor from the backend visitor system and interact with ticket system to update the number of visitors to this circus. The users of the CTS system are circus visitors, circus workers, and the administrator. The administrator can access the system management functions of the CTS system including circus management and security configuration.

1. List the functional requirements of the system.
2. Make use case diagrams for all functions in the system

Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

المملكــة العربيــة السعوديــة
الهيئــة الوطنيــة للتقويــم
والاعــتمــاد الأكــاديـمـي

Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

المملكــة العربيــة السعوديــة
الهيئــة الوطنيــة للتقـويـم
والاعـتـمــاد الأكــاديـمــي

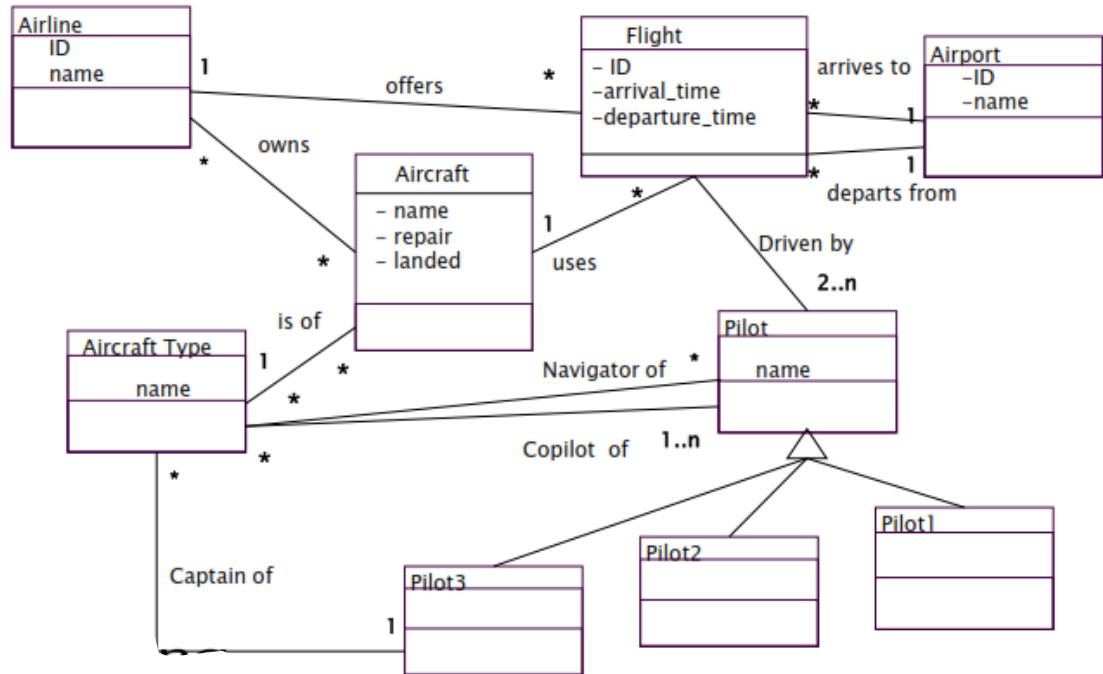| Requirement ID	Description
F1	Buy ticket
F1.1	Retrieve availability and price of festival
F1.2	Handle credit payment
F1.3	Generate QR CODE
F1.4	Decrease available places of festival
F2	Check Ticket
F2.1	Retrieve QR CODE
F2.2	Retrieve name of visitor and of festival
F2.3	Check validity of ticket for the festival
F3	Manage users
F3.1	Handle login
F3.2	Handle logout
F3.3	Define festival, define available tickets, price

Exercise 2: *(Domain Model) (11 points)*

We want to model a system for management of flights and pilots of an airline operates flights. Each airline has an ID. Each flight has a departure airport and an arrival airport: an airport has a unique identifier. Each flight has a pilot and a co-pilot, and it uses an aircraft of a certain type; a flight has also a departure time and an arrival time. An airline owns a set of aircrafts of different types. An aircraft can be in a working state or it can be under repair, and in a particular moment an aircraft can be landed or airborne. A company has a set of pilots. A type of aircraft may need a particular number of pilots, with a different role (Ex. captain, co-pilot, and navigator): there must be at least one captain and one co-pilot.

Draw a class diagram for this information, and be sure to label all the associations (relationships) with appropriate multiplicities.

Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

المملكــة العربيــة السعوديــة
الهيئـــة الوطنيــة للتقويـم
والاعـتمــاد الأكـاديـمــي

Answer:

Flights – solution

Exercise 2: *(Activity Diagram) (5 points)*

Construct an activity diagram with **swimlane** for the following scenario which describes the Open Access Insurance System which is used to provide automotive insurance to car owners:

Initially, prospective *customers* fill out an insurance application, which provides information about the customer and his or her vehicles. This information is sent to an *agent*, who process the application and sends it to various *insurance companies* to create quote for insurance and return the response to the *agent*. When the responses return, the *agent* then determines the best policy

Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

المملكــة العربيــة السعوديــة
الهيئــة الوطنيــة للتقـويـم
والاعــتـمــاد الأكـاديـمــي

for the type and level of coverage desired and gives the *customer* a copy of the insurance policy proposal and quote.

Answer:
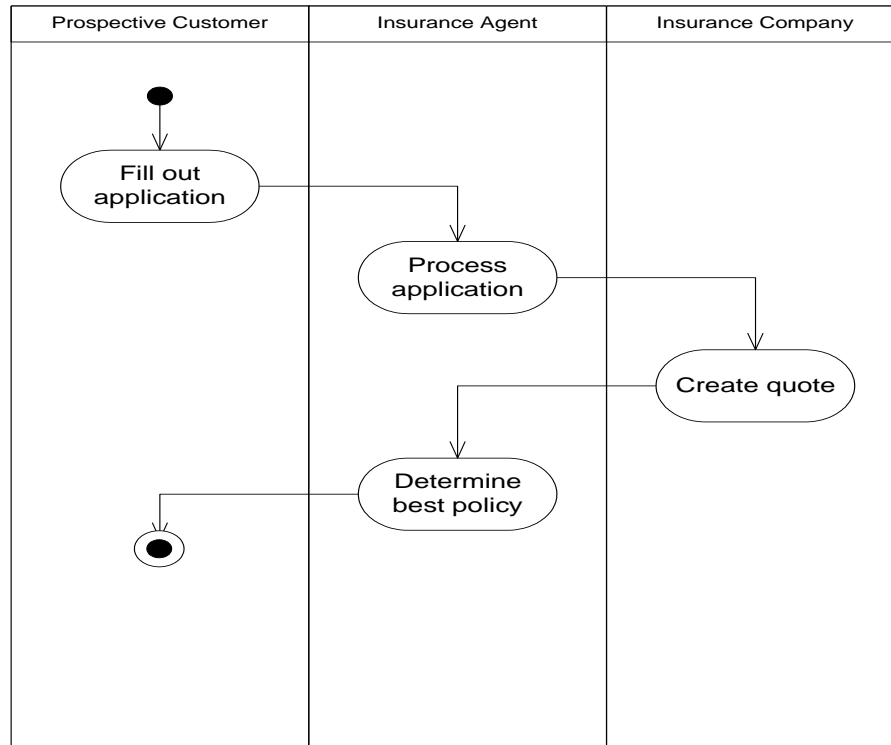
Exercise 4: *(Architectural Design) (3 points)*

1. High cohesion is desirable, and a highly cohesive subsystem has:
   a) Many dependencies among its components
   b) A few dependencies among its components
   c) Many dependencies on other subsystems
   d) A few dependencies on other subsystems

2. Loose coupling is desirable, and a loosely coupled subsystem has:
   a) Many dependencies among its components
   b) A few dependencies among its components
   c) Many dependencies on other subsystems
   d) A few dependencies on other subsystems

3. Which of the following statements is FALSE about cohesion and coupling:
   a) Loose coupling results in sub-system independence

Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

المملكــة العربيــة السعوديــة
الـهيئــــة الوطنيــــة للتقـويـم
والاعــتـمـــاد الأكـاديـمــــي

b) Loose coupling makes modification and maintenance difficult
c) A highly cohesive subsystem contains strongly related objects
d) In a highly cohesive subsystem all elements are directed toward performing the same task

Answer:

1	2	3
a	d	b

Exercise 6: *(Testing)* *(10 points)*

Given the following flow graph of an algorithm:
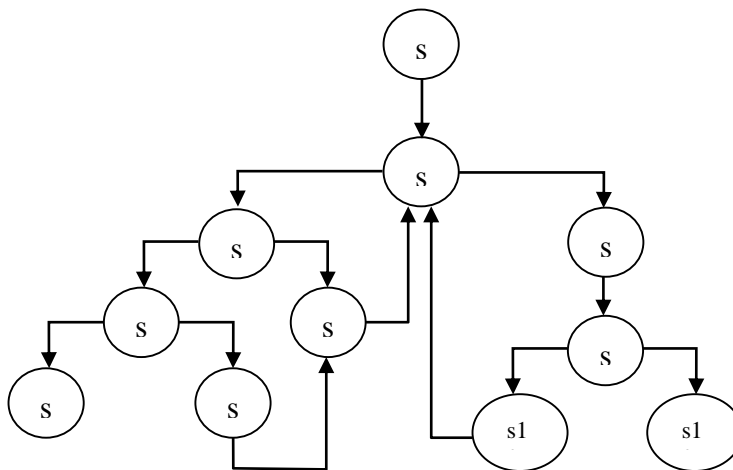
1. Determine the cyclomatic complexity of the flow graph.

$13 - 11 + 2 = 4$

2. Determine the basis set of independent paths.

1-2-3-5-6   1-2-3-5-7-4-2-3-5-6   1-2-8-9-12   1-2-8-9-10-2-8-9-12

3. Put a cross (X) in the relevant box:

	Black-Box Testing	White-Box testing	Validation Testing	Defect Testing
Path Testing	X			X
Partition Testing	X			X
Requirements Testing	X		X	
Structural Testing		X	X	