



# King Saud University

College of Computer and Information Sciences  
Computer Science Department

|                  |                        |                      |         |  |
|------------------|------------------------|----------------------|---------|--|
|                  | Course Code:           | CSC 342              |         |  |
|                  | Course Title:          | Software Engineering |         |  |
|                  | Semester:              | Spring 2017          |         |  |
|                  | 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                                | 20%        |
| √                 | c) Design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;  | 2.2            | Ex. 4-5                              | 40%        |
| √                 | 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            | ----                                 | ---        |
| √                 | i) Use current techniques, skills, and tools necessary for computing practices.   | 1.3            | Ex. 4                                | 15%        |
|                   | 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. 2-3                              | 25%        |

*This exam comprises 5 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.*

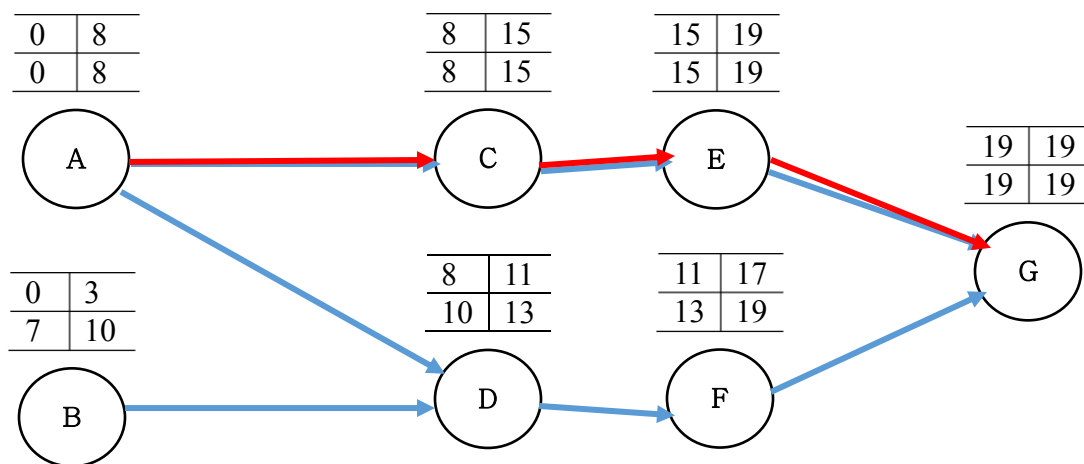
**Good luck!**

**Exercise 1:** (8 marks)

A network consists of the activities in the following list. Times are given in weeks.

| Activity | Preceding | Time |
|----------|-----------|------|
| A        | --        | 8    |
| B        | --        | 3    |
| C        | A         | 7    |
| D        | A, B      | 3    |
| E        | C         | 4    |
| F        | D         | 6    |

1. Draw the activity network related to the table and compute for each task the earliest start time (ES), earliest finish time (EF), latest start time (LS), and latest finish time (LF)?



2. Give the critical path.

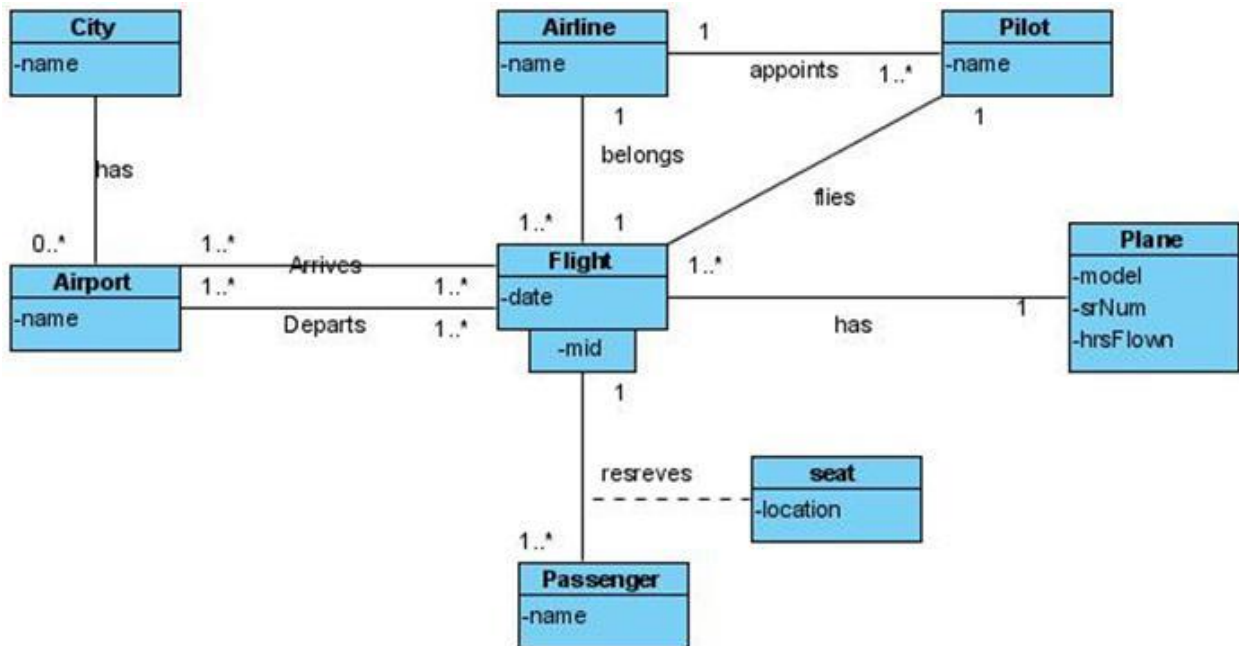
**A - C - E - G**

**Exercise 2:** (8+6 marks)

Consider the airline management system. Many flights land and depart from city's airport. Each city may have more than one airports. Every airline has many flights. The planes may have many flights to different airports. There are pilots for each airline and they fly many flights. Each flight is identified by flight number and date on which flight is scheduled. The passenger reserves an economy class seat or a business class seat for a flight. The seat is identified by a location.

Draw a class diagram to model the system. You should use different elements of class diagrams

such as classes, aggregation, composition, multiplicity, and inheritance.



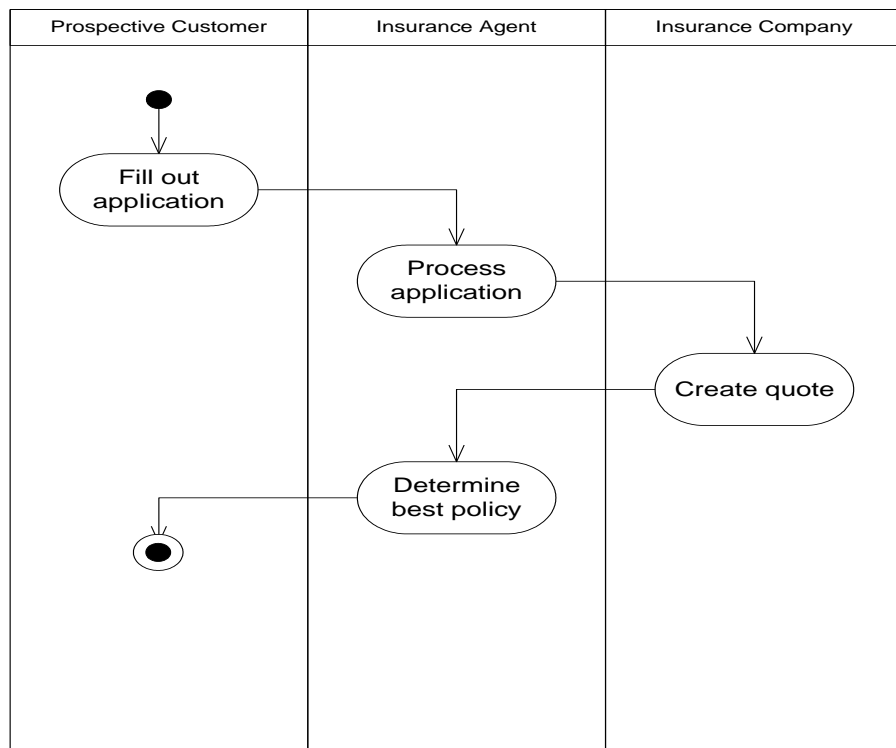
**Answer:**

### **Exercise 3:** (8 marks)

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

**Answer:**



**Exercise 4:** (5 marks)

1. Mark T (True) or F (False):

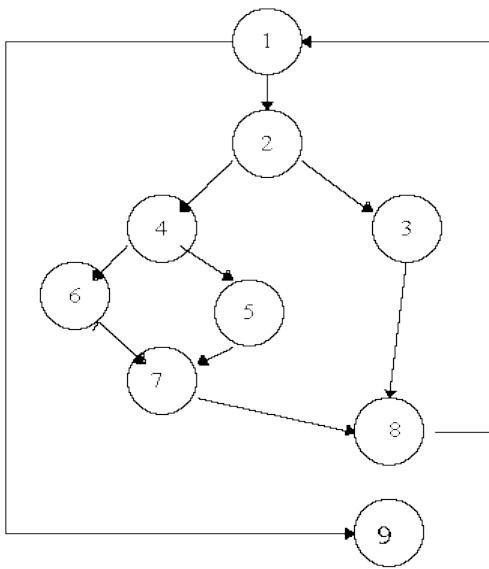
- a) In white-box testing, the tester does not have the source code
- b) Black box testing is based on the system specification
- c) The objective of equivalence partitioning is to increase the number of test cases
- d) Cyclomatic complexity equals the number of independent paths the program
- e) Path testing is a black box testing

**Answer:**

|   |   |   |   |   |
|---|---|---|---|---|
| a | b | c | d | e |
| F | T | F | T | F |

**Exercise 5:** (5 marks)

Given the following flow graph of the previous algorithm:



1. Determine the cyclomatic complexity of the flow graph.

**Answer:  $11 - 9 + 2 = 4$**

2. Determine the basis set of independent paths.

**Answer:**

**P1: 1-9**

**P2: 1-2-3-8-1-9**

**P3: 1-2-4-6-7-8-1-9**

**P4: 1-2-4-5-7-8-1-9**

|               |                               | Result  |                    |           |              |  |
|---------------|-------------------------------|---|--------------------|-----------|--------------|--|
| Question No.  | Relevant ABET Student Outcome | Relevant NCAAA Student Outcome  | SO is Covered by % | Full Mark | Student Mark | Assessor's Feedback  |
| Ex. 1         | b                             | 2.1   | 20%                | 8         |              |  |
| Ex. 2         | k                             | 1.5   | 20%                | 8         |              |  |
| Ex. 3         |                               |   | 20%                | 8         |              |  |
| Ex. 3         | i                             | 6   | 15%                | 6         |              |  |
| Ex. 4         | c                             | 2.2   | 12.5%              | 5         |              |  |
| Ex. 5         |                               |   | 12.5%              | 5         |              |  |
| <b>Totals</b> |                               |   | <b>100%</b>        | <b>40</b> |              |  |
|               |                               | <p>I certify that the work contained within this assignment is all my own work and referenced where required.</p> <p><b>Student Signature:</b> _____ <b>Date:</b> _____</p> |                    |           |              | <p><b>Feedback Received:</b></p> <p><b>Student Signature:</b> _____ <b>Date:</b> _____</p> |