King Saud University

College of Computer and Information Sciences
Computer Science Department

Course Code:	**CSC 342**
Course Title:	**Software Engineering**
Semester:	**Spring 2018**
Exercises Cover Sheet:	**Final Exam** — **3 hours**

Student Name:	.....
Student ID:	.....
Department Name:	.....

Q	mark	
Q1		7
Q2		5
Q3		5
Q4		5
Q5		5
Q6		8
Q7		5
Total		40

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**	*Q7*	
√	**c) Design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;**	**2.2**	*Q4, Q5*	
√	**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**		
	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**	Q6	
	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**	Q3	
√	**General Question**	-----	*Q1, Q2*	

Question #1: [/ 7 Points]

Circle the most appropriate answer (You should select one answer ONLY)

1. The sequence of activities which add up to the longest overall duration is known as the:
   a) slack
   b) critical path
   c) total float
   d) sequence diagram.
2. A suitable control model for an elevator software system would be:
   a) event driven
   b) manager model
   c) call return
   d) any of the above.
3. Which of the following is not a project manager's activity?
   a) project control.
   b) project management.
   c) project planning.
   d) system design.
4. If you would like to describe a complex interaction scenario, which diagram would you use
   a) Class diagram
   b) Object diagram
   c) Sequence diagram
   d) Collaboration diagram.
5. Which of the following would not be an appropriate class name:
   a) Student
   b) Instructor
   c) Course
   d) Saeed
6. Which of the following is **not** a project feature:
   a) has a unique purpose.
   b) is temporary.
   c) is expensive.
   d) involves uncertainty.
7. Which of the following is **not** among the main factors that lead to a failure project:
   a) an unrealistic deadline
   b) contingency planning
   c) technical difficulties
   d) underestimate of efforts

Question #2: [/ 5 Points]

Indicate whether each of the following statement is "true" or "false". Justifying any "false" choice.

Statement	Answer [T / F]
1. Report writing and presentations is a responsibility of the project manager.	**T**
2. The main objective of equivalence partitioning is to reduce the number of test cases.	**T**
3. In system structuring the subsystems are composed into a coherent system. The system is decomposed into several principal subsystems	**F**
4. Activities in a project should be organized to produce tangible outputs.	**T**
5. Software Engineering is an engineering discipline that is concerned with all aspects of software production.	**T**
6. System testing is the responsibility of the developers. Separate team	**F**
7. Interrupt-driven control model is usually used in real time systems.	**T**
8. Testing can only detect the presence of errors, not their absence.	**T**
9. A module is a system component that can normally be considered as a separate system. that provides services to other components but not normally be considered as a separate system.	**F**
10. A sub-system is a system in its own right whose operations can be considered as "independent" of the services provided by other sub-systems.	**T**

Question #3: [/ 5 Points]

a. Match each of the following software process with its description.
[/ 2.5 Points]

Software Process	Matching	Description
a. **Requirements specification**	3	**1.** Creating representations of the domain or the software
b. Design	5	**2.** Modification to correct faults, to improve performance or other attributes
c. Modeling	1	**3.** Describing the software system to be developed
d. Maintenance	2	**4.** Showing that a system conforms to its specification.
e. **Validation**	4	**5.** Deciding how the requirements should be implemented, using the available technology

b. Match each of the following architecture attribute with the guideline that help implementing it.
[/ 2.5 Points]

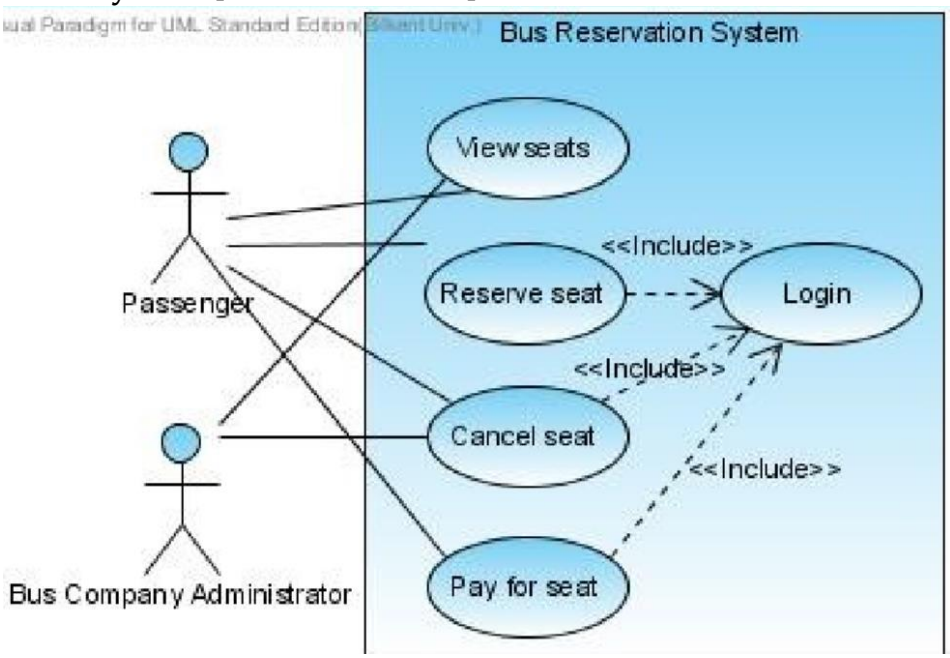
Architecture Attribute	Matching	Guideline
a. **Performance**	2	1. Include redundant components.
b. Security	4	2. Localise operations to minimise sub-system communication.
c. Safety	5	3. Use fine-grain self-contained components.
d. Availability	1	4. Use layered architecture with critical assets in inner layers.
e. **Maintainability**	3	5. Isolate critical components.

Question #4: [/ 5 Points]

Consider an online reservation system for a bus company. The bus company includes several buses and realizes trips to different cities. Each bus is identified by its plate number and a separately assigned bus number. The trips are based on a predefined schedule and stop at predefined bus stations. Each bus can have only one trip per day. Each bus includes a driver and one hostess (presenter). For long trips, the bus will have breaks at service and rest areas. There are two types of trips, normal trips and express trips. Express trips do not stop at intermediate stations and get faster at the destination.

Seats can be reserved by customers on the web site of the bus company. The customer has the option to directly pay for the seat through the website. In that case, the seat cannot be cancelled (neither by the customer nor by the bus company). If the customer has not paid for the seat, the bus company can cancel the seat if the customer does not show up one hour before the trip. When the reservation is cancelled, the seat will become free and can be sold to another customer. Both the customer and the company staff must login for performing operations with the system.

a. **Draw a use case diagram for describing the functional requirements of the above system. [/ 3 Points]**



b. **Define at least two stakeholders other than the actors. [/ 1 Point]**

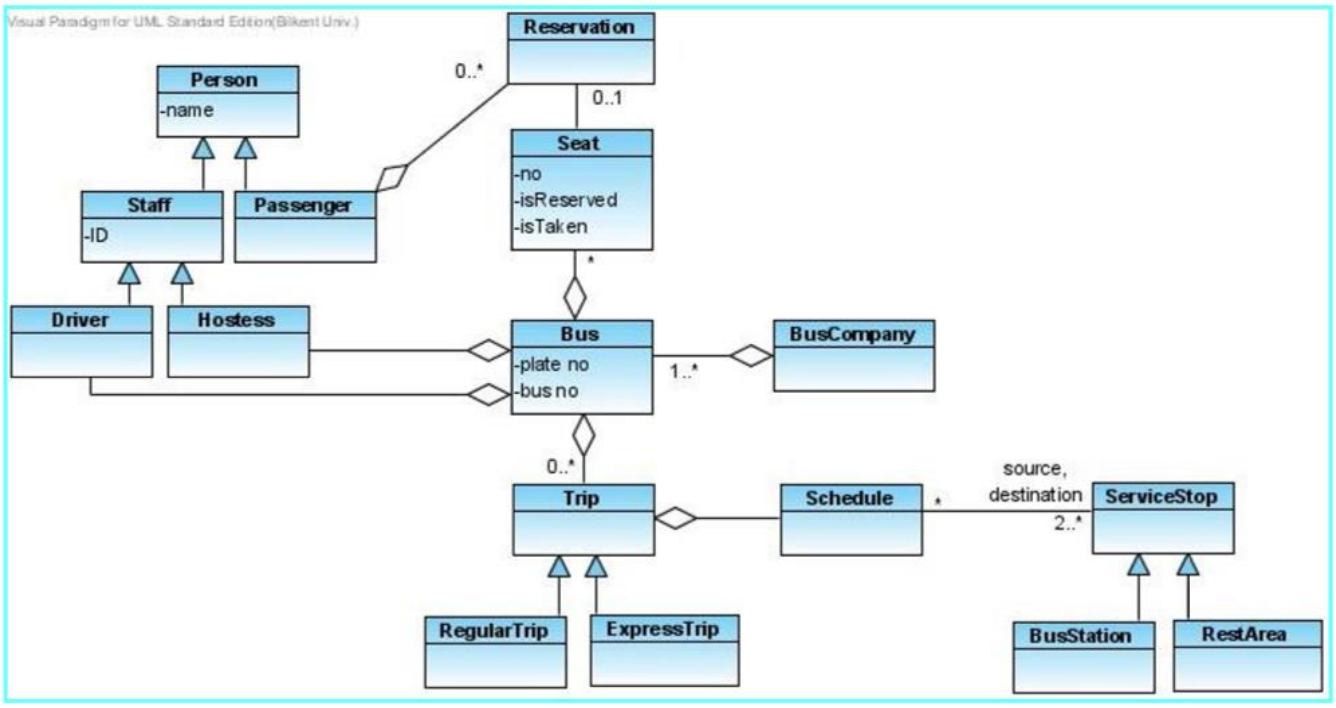
company manager project manger, tester , ministry of transportation.

c. **Suggest two non-functional requirements that could be important for the above system. [/ 1 Point]**

Time Performance: timely response by the system to the passengers is important.
Cost: the new system should not be very expensive; otherwise the budget cannot be justified.
Reuse: it'd be nice for the developer to reuse this system for other reservation systems.
Other possible non-functional requirements include Adaptability and Security.

Question #5: [/ 5 Points]

Draw a domain model for the online reservation system for the bus company described in Question # 4,



Question #6: [/ 8 Points]

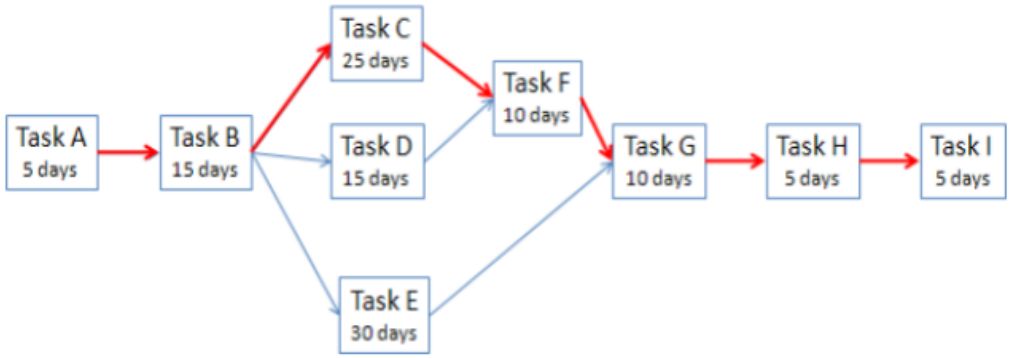
Using the information in the table below, assuming that the project team will work a standard working week (5 working days in 1 week) and that all tasks will start as soon as possible:

Task	Description	Duration (Working Days)	Predecessor/s
A	Requirement Analysis	5	
B	Systems Design	15	A
C	Programming	25	B
D	telecoms	15	B
E	Hardware Installation	30	B
F	Integration	10	C, D
G	System Testing	10	E, F
H	Training/Support	5	G
I	Handover and Go-Live	5	H

a) Draw the activity network of this project showing the slack of each activity

[/ 4 Points]

(b) (i) The critical path of the project can be ascertained as follows:



b) State the critical path of the project [/ 1 Points]

The critical path runs through Tasks, A, B, C, F, G, H and I.

c) Calculate the planned duration of the project in weeks [/ 1 Points]

The sum of the critical task durations is 75 days - therefore the planned duration of the project is 15 weeks.

d) If you were the project manager, and you were requested to finish in a shorter time than the planned duration. State two general approaches that you may follow to achieve this goal [/ 2 Points]

- Pruning critical path activities (cutting some of them if possible)
- "Fast tracking" (performing more activities in parallel)
- "Crashing the critical path" (shortening the durations of critical path activities by adding resources)

Question #7: [/ 5 Points]

a. Your company, Crazy Software Ventures, has decided to develop a new word processor called BeyondWords (BW for short). BW is intended to compete directly with Microsoft Word and similar products from other companies.

1. **Which of the following would be an appropriate process model for this type of software products? Justify your answer. [/ 1 Points]**
   a. waterfall
   b. evolutionary
   c. spiral.

2. **State an advantage and a disadvantage of your selected model. [/ 1 Points]**

Dis:

- the difficulty of accommodating change after the process is underway
- Inflexible partitioning of the project into distinct stages
- Inflexible to respond to dynamic business environment leading to requirements changes

Adv: Appropriate when the requirements are well-understood and stable. E.g security or time critical systems

b. You are designing a software system to manage a hotel. The system should have a central database that includes all information regarding accommodation, customers, staff, booking, etc.

1. **Identify a suitable architecture style for the above system. Justify your choice. [/ 1 Points]**

shared data repository because we have a central DB

2. **List two advantages and two disadvantages of this architecture style. [/ 2 Points]**

- **Advantages**
  - Can efficiently share large amounts of data
  - Sub-systems need not be concerned with how data is produced by other sub-systems
  - Centralized backup, access control, and error recovery
  - New tools compatible with the repository schema (data model) are easily integrated
- **Disadvantages**
  - Sub-systems must agree on a repository data model, compromising on needs of each tool, affecting performance and integration with incompatible tools
  - Translating data into different data model is difficult, expensive, or impossible;
  - Same policy forced on all sub-systems
  - Difficult to distribute repository over many machines efficiently, leading to problems with data redundancy and inconsistency

	Result					
Question No.	**Relevant ABET Student Outcome**	**Relevant NCAAA Student Outcome**	**SO is Covered by %**	**Full Mark**	**Student Mark**	**Assessor's Feedback**
Q. 1				7		
Q. 2				5		
Q. 3	k	1.5		5		
Q. 4	c	2.2		5		
Q 5	c	2.2		5		
Q. 6	i	1.3		8		
Q. 7	b	2.1		5		
Totals			**100%**	**40**		
	I certify that the work contained within this assignment is all my own work and referenced where required. **Student Signature:** **Date:**					**Feedback Received:** **Student Signature:** **Date:**