

CS-3009: Software Engineering CS F-G-H-Y-Z

Sessional-II Exam

Total Time: 1 Hour
Total Marks: 60

Date: 4th April, 2024

Course Instructor(s)

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Roll No.

Cr
Course Section

Anas
Student Signature

Do not write anything on the question paper except the information required above.

Instructions:

1. Read the question carefully, understand the question, and then attempt your answers in the provided answer booklet.
2. Verify that you have **four (4)** printed pages of the question paper including this page. There are **four** questions.
3. Calculator sharing is strictly prohibited.
4. **Return the Question Paper along with answer sheet.**
5. **You can attempt questions in any order but attempt complete question with all parts. (else -6)**

Q1: Write the correct in the following table. Cutting, multiple answers and overwriting will result in zero marks [10 marks]

MCQ NO.	1	2	3	4	5	6	7	8	9	10
Option	a	d	b	a	c	a	c	b	c	c

1. The initial version of the software is released to the public so they can identify the bugs voluntarily. This testing is known as
☒ a) Alpha testing
b) Gamma Testing
c) Beta Testing
d) V Model Testing
e) None of the above
2. Test execution can be done
a) using manual approach
b) using an automatic approach
c) using a semi-automatic approach
☒ d) All of the above
e) None of the above
3. Which of the following gives a reality check on what can or cannot be done technically or within given cost constraints
a) Requirement Correctness
☒ b) Requirement Feasibility
c) Requirement Validation
d) Requirement Prioritization
e) None of the above
4. The activation bar in a sequence diagram represents:
☒ a) The period during which an object is performing an operation
b) The message exchange between objects
c) The creation of a new object

- d) The destruction of an object
5. *In a client-server architecture, the principle of separation of concerns primarily ensures that:*
- a) Client and server can be developed in different programming languages
 - b) Each server can only respond to one client at a time
 - ☒ c) Client and server perform distinct functionalities, enhancing modularity
 - d) Data transmission between client and server is encrypted
6. *In an activity diagram, swimlanes are used to:*
- ☒ a) Represent concurrent actions within the system
 - b) Organize activities into phases or milestones
 - c) Differentiate between different types of activities
 - d) Indicate responsibilities of different roles or parts of the system
7. *The primary purpose of using context diagrams in software engineering is to:*
- a) Model complex algorithms within the system
 - b) Illustrate the system's architecture in detail
 - ☒ c) Identify and communicate external interfaces and data flow
 - d) Detail the user interface of the system
8. *What is the outcome of the requirement elicitation process?*
- a) A software prototypes
 - ☒ b) A requirements specification document
 - c) Final software product
 - d) A test plan
9. *14. According to Wiegers' model for test case prioritization, what should be done when different criteria have varying levels of importance to the project stakeholders?*
- a) Assign equal weight to all criteria to maintain impartiality.
 - b) Ignore the less important criteria completely. ^
 - ☒ c) Assign weights to criteria based on their importance to stakeholders.
 - d) Choose criteria randomly to ensure variety. >
10. *What role does a tester play in Black Box Testing?*
- a) The tester needs to know how the software is implemented.
 - b) The tester must have programming skills to write unit tests.
 - ☒ c) The tester focuses on executing the functionalities without knowing the internal code structure.
 - d) The tester is usually the one who writes the software code.

Q2: Perform Equivalence Class Partitioning (ECP) on the following form:

[20 marks]

1. Identify Valid and Invalid classes for each field.
2. How many test cases are required if weak ECP is performed?
3. How many test cases are required if a strong ECP is performed?
4. Write test cases in tabular form according to weak ECP, write the result as pass/ fail.

Note: Write actual input data value for each field in the test cases e.g. 'Ali 'as Username instead of ABC or any random string.

The detailed requirements of the above form are as follows.

Username:

1. It should not accept more than 12 characters
2. At least 5 characters are required as a username
3. It should not accept any special characters and spaces
4. It should only contain alphabets.

Email:

1. It should be of the format Ali@example.com
2. It should not exceed 254 characters in length.

Phone Number:

1. The phone number field should be 11 digits only.
2. It should not contain any space.
3. The first two digits must be 03.

Password:

1. It should contain 7 to 11 characters.
2. It contains at least 1 uppercase, 1 lowercase, 1 digit, and 1 special character.
3. It should not contain any spaces.



Q3: Software Architecture

[15 marks]

a. Choose the most appropriate architectural pattern for the below software problems. Also, state the reason why you have chosen the architecture. [10 Marks]

Wants a distributed system with a structure that enables that service users do not need to know the nature or location of service providers

- i. A system for managing air traffic that consists of an user interface that uses flight management and sector management that uses a set of classes providing general aeronautical services that uses general support mechanisms such as network, storage, resource management etc.
- ii. Need software for digital speedometer for boats. The software should be flexible to support a varying number and types of displays (from single LED displays to large displays), and different graphic design on displaying speed of display.
- iii. The Audiofy system is an application for changing audio in real-time by applying audio effects. The system has several audio effects that can be applied to the input audio one after another. Furthermore, the implementation of the audio effects might be changed to improve performance. Audiofy has planned to add new audio effects to the application in later releases.
- iv. Need software for a smartphone game where players can play against each other via Bluetooth and requires no access to the internet. [1+1]

v.

b. Read the given description of below system: [5 Marks]

An e-mail system is comprised of incoming e-mails from whitelist, blacklist and Spams. Emails from senders on the whitelist are accepted whereas emails from senders on the blacklist are deleted. A SpamAssassin tool apply some checks for email filtering and emails that do not pass this check are marked as spam. E-mails that do not pass from SpamAssassin are marked as spam e-mails. The system will run on a single-core server machine, but may be moved to a multi-core server if the load gets too high.

- i. Name one architectural pattern that you will use. [1]
- ii. Draw a diagram that describes your system architecture. [4]

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Q4: Wiegers' priority matrix

[15 marks]

The essence of this requirement prioritization technique is the priority matrix, thanks to which the rank of individual requirements can be calculated on the basis of specific criteria and weight for these criteria.

Using Wiegers' priority matrix, calculate the priority of the following requirements (show all formulas and working)

How to attempt: Please rewrite the table on the answer sheet and fill it. Please note that it is mandatory to show all calculations and formulas.

Relative Weight	2	2			1		0.5			
Requirements	Relative Benefit	Relative Detriment	Value Total	Value%	Relative Cost	Cost%	Relative Risk	Risk%	Priority	Rank
R1	6	3	18	13.30	2	13.33	1	8.33	0.988	1
R2	9	7	32	30.76	4	26.67	2	16.67	0.278	2
R3	4	7	22	21.35	4	26.67	2	16.67	0.604	3
R4	2	1	6	5.76	1	6.67	3	25	0.300	5
R5	4	9	26	25	4	26.67	4	33.33	0.576	4
Total	25	27	104	100%	15	100%	12	100%	3.346	15

Question # 02

a) *

Username :-

④

~~Invalid~~ Invalid

Valid

format:

< 5

5-12, {a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z,0,1,2,3,4,5,6,7,8,9}

> 12

{a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z,0,1,2,3,4,5,6,7,8,9}

Space: ' ' ' ' ' '

Special characters: { \$, %, #, \, /, @, ! }

Email:-

③

Invalid

Valid

format

< 1

1-254

- @ example.com

> 254

Phone number:-

④

~~Invalid~~ Invalid

Valid

format (digits)

< 1

11

03-----

< 11

> 11

Password:-

③

Invalid

Valid

format:

< 7

7-11

1 upper case, 1 lower

~~> 11~~ > 11

~~Invalid~~

and 1 special character

' ' ' ' ' '

- b) If ^{the} ECP is weak then, 4 test cases are required.
- c) If the ECP is strong then, 144 test cases are required.

d)

Test case ID	Input Data	Output
ali@ahmed	, ali@gmail.com, 03000000000, abcdefgh	Pass
ali	, ali@gmail.com, 03123456789, abcdefgh	fail
ali@ahmed	, ali@gmail.com, 03123456789, abc	fail
ali@ahmed	, @gmail.com, -, abcdefgh	fail

Question # 03 (a)

1)

Reason:-

Object oriented (object broker)

It is a type of management system ~~as~~ representing the classes in object oriented manner will be feasible.

2)

Reason:-

MVC

The software must be made such that it supports a varying number of displays. Using MVC architecture we can ~~to that~~ create variety of views.

3)

Reason:-

Pipe and Filter

Audio effects can be applied on input audio one after another. The implementation might change to improve performance.

In pipe and filter we ^{also} can add new filters.

4)

Peer - Peer

Reason:-

Players are able to play against each other and each player act as client, and vice versa (server).

First part

5)

Black board

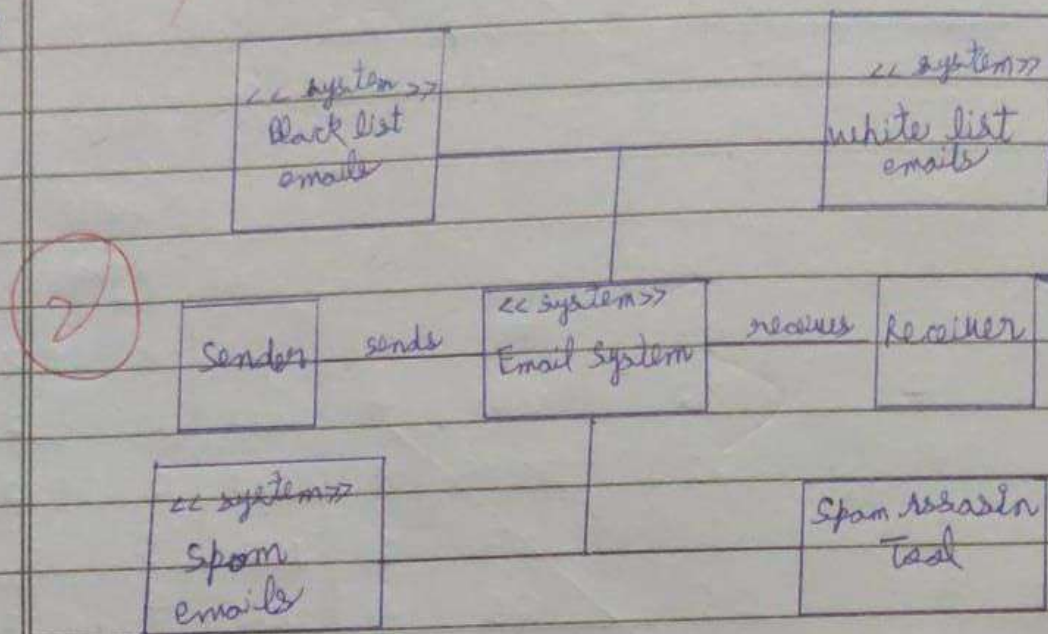
Reason:-

A distributed environment system, hiding its nature complexity. ~~and location~~

Question #03 (b)

i) Layered architecture

ii)



Q/Part No.

Question # 04

$$* \text{Value total} = \text{weight} * \text{benefit} + \text{weight} * \text{detriment}$$

$$\text{Priority} = \frac{\text{Value (\%)}}{\text{Relative Cost} * \text{Cost (\%)} + \text{Relative Risk} * \text{Risk (\%)}}$$

Relative weight	2	2			1		0.5			
Requirements	Relative benefit	Relative detriment	Value total	Value (%)	Relative Cost	Cost (%)	Relative risk	Risk (%)	Priority	Rank
R ₁	6	3	18	17.30	2	13.33	1	8.33	0.985	1
R ₂	9	7	32	30.76	4	26.67	2	16.67	0.878	2
R ₃	4	7	22	21.15	4	26.67	2	16.67	0.64	3
R ₄	2	1	6	5.76	1	6.67	3	25	0.300	5
R ₅	4	9	26	25	4	26.67	4	33.33	0.56	4
Total	25	27	104	100%	15	100%	12	100%	3.346	15