



COMSATS UNIVERSITY ISLAMABAD (CUI)

DEPARTMENT OF COMPUTER SCIENCE
TERMINAL EXAMINATION SPRING - 2024
BS (CS/AI/DS/SE/)- VI SEMESTER

Course: CSC291-Software Engineering Concept

Maximum Marks: 50

Dated: 06, 05, 2024

Time Allowed: 180 Minutes

Instructor: Dr. Uzair Iqbal Janjua and Mr. Atique Ahmad Zafar

Note: All questions are self-explanatory and require no further explanations during exam time.

- Make sure that you have signed the attendance sheet before leaving the examination room.
- Return the question paper along with the answer sheet.
- Attempt all questions on answer sheet.

(CLO – 1: Explain the concept of software engineering along with its processes and deliverables.)

Q.# 1.

[2 Marks]

Define any 2 principles which are important to apply agile methods.

Customer involvement	Customers should be closely involved throughout the development process. Their role is provide and prioritize new system requirements and to evaluate the iterations of the system.
Incremental delivery	The software is developed in increments with the customer specifying the requirements to be included in each increment.
People not process	The skills of the development team should be recognized and exploited. Team members should be left to develop their own ways of working without prescriptive processes.
Embrace change	Expect the system requirements to change and so design the system to accommodate these changes.
Maintain simplicity	Focus on simplicity in both the software being developed and in the development process. Wherever possible, actively work to eliminate complexity from the system.

Q.# 2.

[2 Marks]

Your team of software engineers is required to develop a web-based software system that allows the management of supplies and distributions in a dried foods factory. Most of the workers in that factory are not familiar with the capabilities of a computerized system. Suggest the appropriate software process model to be used in the development process and describe at least two reasons of choosing that process model?

Solution:

Rapid Prototyping model can be used in this situation. As stated above that factory workers are not familiar with the capabilities of computerized system. Therefore, they are not able to properly

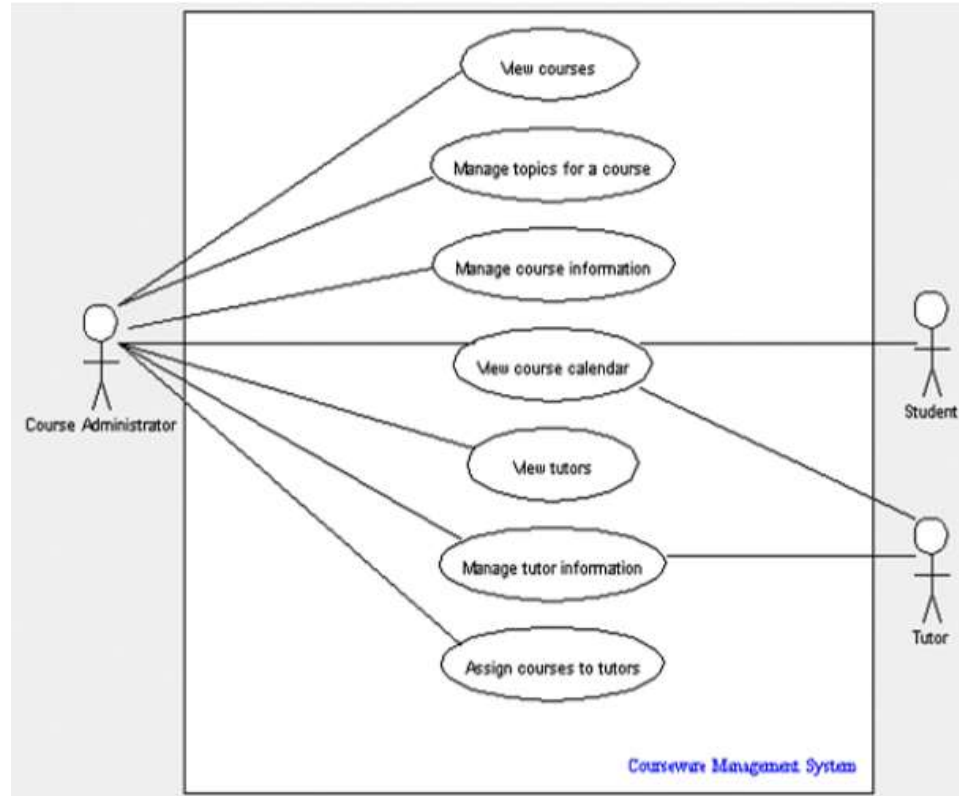
describe their requirements. Hence, it is appropriate to use prototyping to get the desired result. The other reason is that this model is in the umbrella of incremental process model. Therefore, after every module delivered requirements can be changed easily.

(CLO – 2: Identify functional and non-functional requirements for a medium size software system)

Q.# 3. Case Study: The organization offers a variety of courses in a variety of areas such as learning management techniques and understanding different software languages and technologies. Each course is made up of a set of topics. Tutors in the organization are assigned courses to teach according to the area that they specialize in and their availability. The organization publishes and maintains a calendar of the different courses and the assigned tutors every year. There is a group of course administrators in the organization who manage the courses including course content, assign courses to tutors, and define the course schedule. The training organization aims to use the Courseware Management System to get a better control and visibility to the management of courses as also to streamline the process of generating and managing the schedule of the different courses.

[6 Marks]

Draw a use case diagram for the above system.



Q.# 4. Suppose a bank intends to develop a system to allow its customers to access their account information via the internet. The system will also allow customers to transfer funds between their accounts. The potential quality attributes for the system are: Installability, Usability, Safety, Performance, Security, Modifiability, Portability, and Reliability.

Identify set of quality attributes for the above system, also provide the rationale behind your selection.

[4 Marks]

Solution:

- **Usability.** It is important that the system will be easy to use for customers with minimal training. Customers may also expect some level of interactive support.
- **Performance.** The system should have a mechanism for maintaining a reasonable level of performance. This is particularly important as it will be required to run over the Internet and may have large numbers of customers accessing the services at any one time.
- **Security.** Customers are likely to be concerned about the security of their transactions over the Internet. It is important that safeguards are built into the system to ensure that the transactions are secure.
- **Reliability.** The system should have a low failure rate and a high level of service availability. Customers are unlikely to use the system if it is unreliable.

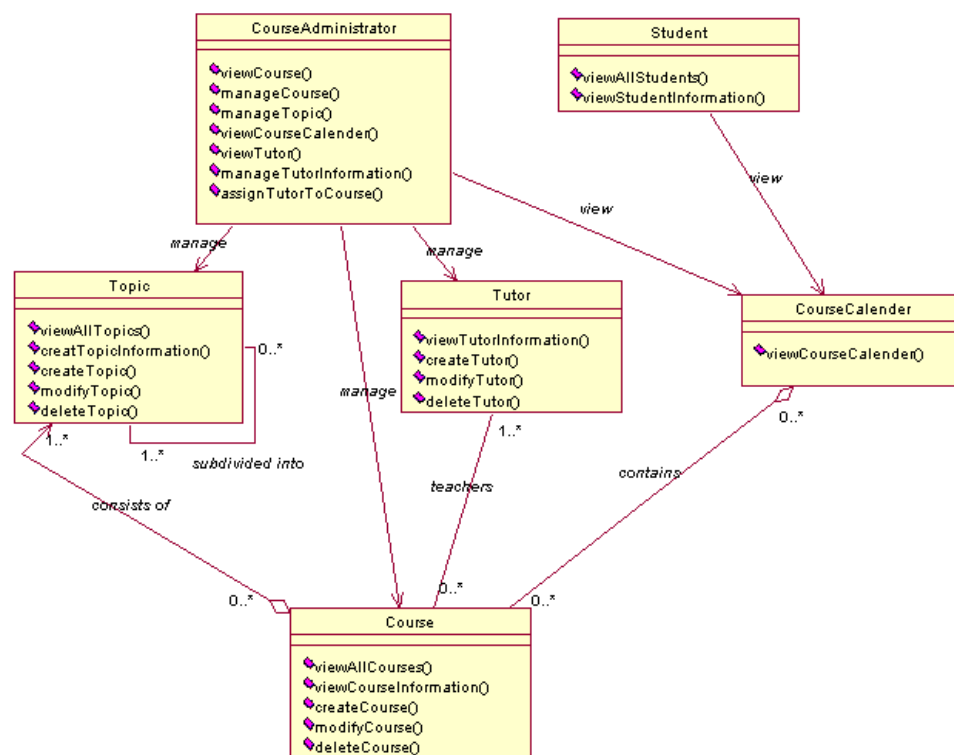
(CLO – 3: Construct appropriate design models for the structure and behavior of medium size software system)

Q.# 5.

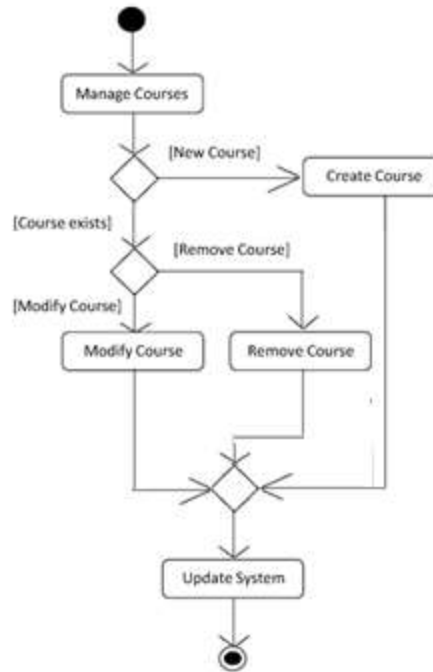
[15 Marks: 5+5+5]

Consider the Courseware Management System (given in question 2) and answer the following questions.

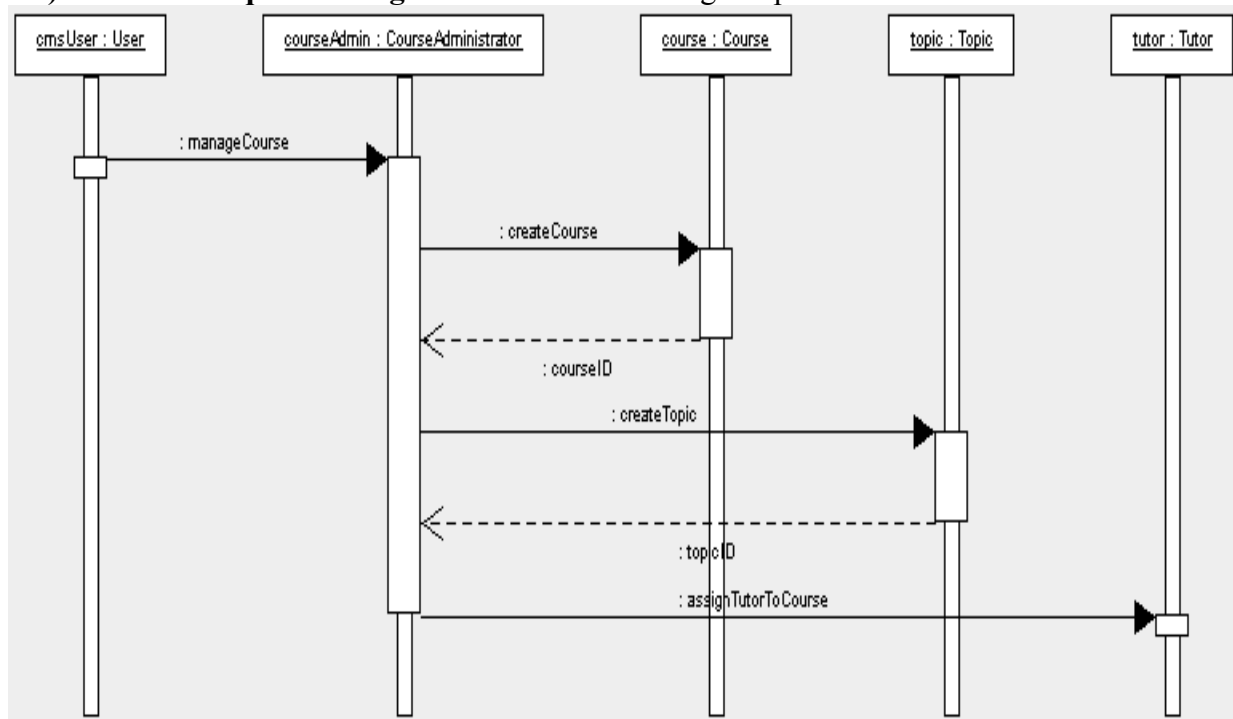
- 5.1)** Draw a **Class Diagram** which must include (attribute(s)/operation(s) visibility, relationships /associations, and multiplicity).



- 5.2)** Draw an **Activity Diagram** of use case: Manage Course Information.



5.3) Draw a **Sequence Diagram** of use case: Manage Topics for Course.



(CLO – 4: Apply software testing and quality assurance techniques to medium size software system)

Q.# 6.

[2 Marks]

Determine independent paths and calculate the cyclomatic complexity for the following piece of code.

0. Integer i,j,k
1. read i,j,k
2. if(i<j)

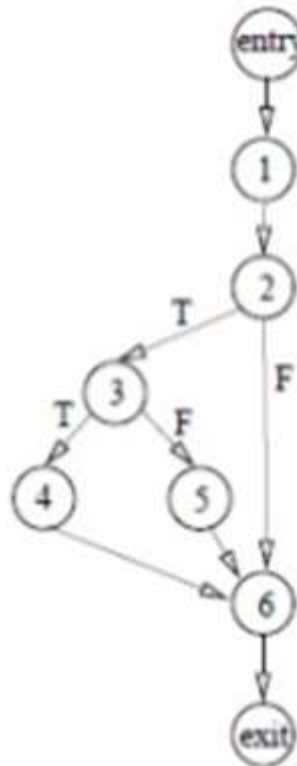
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3. if(j<k)
4.     i=k;
   else
5.     k=i;
   endif
   endif
6. print i,j,k
end example

```

Solution:

1.



$$\begin{aligned}
 2. \quad V(G) &= E - N + 2 \\
 &= 9 - 8 + 2 \\
 &= 3
 \end{aligned}$$

Q.# 7. Compute the function point, productivity, documentation, and cost per function for the following data: [8 Marks]

Number of user inputs = 24, Number of user outputs = 46, Number of inquiries = 8, Number of files = 4, Number of external interfaces = 2, Effort = 36.9 p-m, Technical documents = 265 pages, User documents = 122 pages, Cost = \$7744/ month, Various Weight Factors respectively are 4, 4, 6, 10, and 5, Various processing complexity factors are: 4, 1, 0, 3, 3, 5, 4, 4, 3, 3, 2, 2, 4, and 5.

Measurement Parameter	Count		Weighing factor
1. Number of external inputs (EI)	24	*	4 = 96
2. Number of external outputs (EO)	46	*	4 = 184
3. Number of external inquiries (EQ)	8	*	6 = 48
4. Number of internal files (ILF)	4	*	10 = 40
5. Number of external interfaces (EIF) Count-total →	2	*	5 = 10 378

So sum of all f_i ($i \leftarrow 1$ to 14) = $4 + 1 + 0 + 3 + 5 + 4 + 4 + 3 + 3 + 2 + 2 + 4 + 5 = 43$

$$\begin{aligned}
 FP &= \text{Count-total} * [0.65 + 0.01 * \sum(f_i)] \\
 &= 378 * [0.65 + 0.01 * 43] \\
 &= 378 * [0.65 + 0.43] \\
 &= 378 * 1.08 = 408
 \end{aligned}$$

$$\text{Productivity} = \frac{FP}{\text{Effort}} = \frac{408}{36.9} = 11.1$$

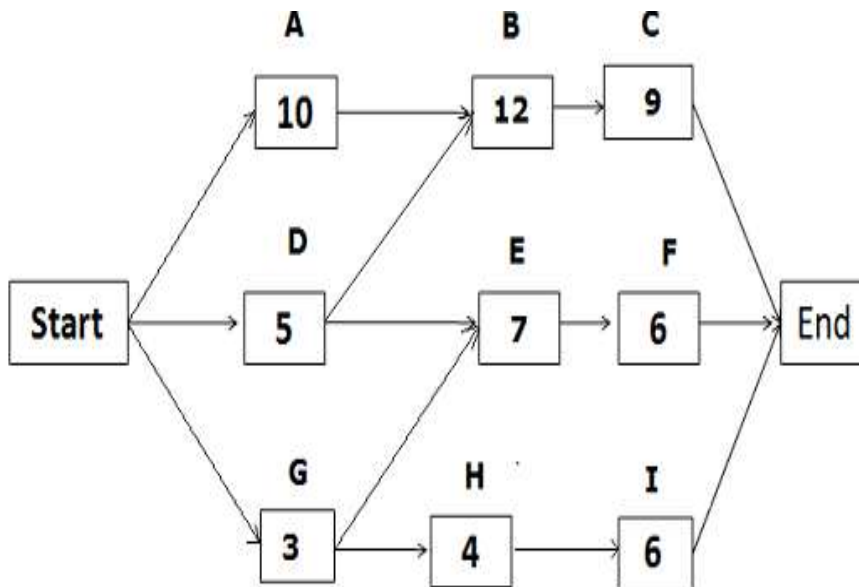
Total pages of documentation = technical document + user document
 $= 265 + 122 = 387$ pages

Documentation = Pages of documentation/FP
 $= 387/408 = 0.94$

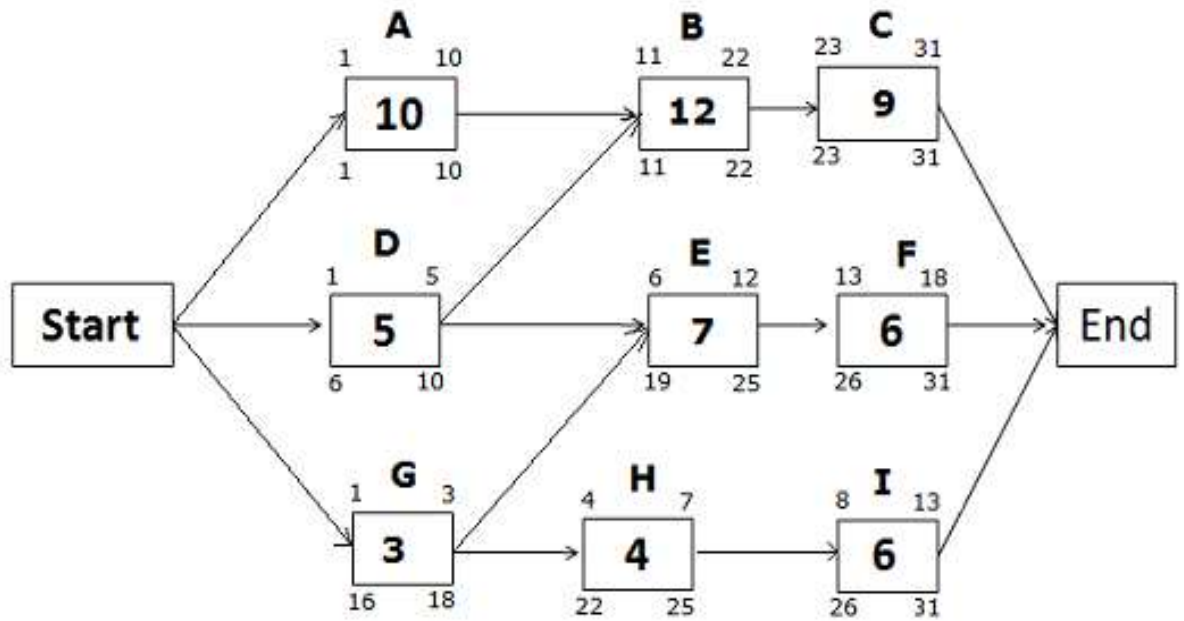
$$\text{Cost per function} = \frac{\text{cost}}{\text{productivity}} = \frac{7744}{11.1} = \$700$$

(CLO – 5: Demonstrate software project management skills and maintenance process)

Q.# 8. Calculate Early Start (ES), Early Finish (EF), Late Start (LS), and Late Finish (LF) and float for each activity. In addition identify the total paths, and critical path. Please note that a single mistake charge you -0.5 marks **[11 Marks]**



Solution



*****BEST OF LUCK*****