Question Paper

Exam Date & Time: 26-Nov-2022 (09:00 AM - 12:00 PM)



DEPARTMENT OF INFORMATION & COMMUNICATION TECHNOLOGY FIFTH SEMESTER B.TECH(IT) END SEMESTER EXAMINATIONS, NOV 2022 SOFTWARE ENGINEERING [ICT 3159]

Marks: 50

Duration: 180 mins.

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)	A)	Select a life cycle model suited to build a system which is complex and should be able to accommodate the following constraints: changes in user requirements, no support for component reusability, use of new technology. Support your selection with suitable justification and describe the process model.	(5)
	B)	For the scenario described below, sketch the swimlane diagram with the required and suitable model elements.	(3)
		PURCHASE Activity is started by Commuter <u>actor</u> who needs to buy a ticket. Ticket vending machine will request trip information from Commuter. This information will include number and type of tickets, e.g. whether it is a monthly pass, one way or round ticket, route number, destination or zone number, etc.	
		Based on the provided trip information ticket vending machine will calculate payment due and request payment options. Those options include payment by cash, or by credit or debit card. If payment by card was selected by Commuter, another actor, Bank will participate in the activity by authorizing the payment.	
	C)	Suppose you have been asked to help develop a new student-transcript system for the university. The system will record students' course marks and (if appropriate) co-op evaluations; will calculate and report each student's major and overall averages, their standing in their programs, their class rank, and other statistical information; and will present a record of a student's academic record as a written transcript.	(2)
		 Give a complete a list of the system's stakeholders, and mention the role that each stakeholder plays. 	
2)		Draw a use-case diagram for the following scenario pertaining to a simple online book portal/web application and write complete use-case specifications for any one use-case.	(5)
	A)	The book portal allows users to buy books which then can be downloaded as archive files containing pdfs. A distinction is made between users and registered users. Only registered users can buy or download books. A user becomes a registered user by logging in. Unregistered users can register with a username that has not been taken by another user and a freely chosen password. Every user can search for books by their name. Other search methods are not offered. The search result is presented as a list of matching books that provides links to a detail page for	

each book. The book detail pages show the title of the book, the name of the author, the TOC and the book's price. If the user has already bought the book then a download link is shown. Otherwise, there will be a link for buying the book. Only full books can be downloaded. Each book has only one author. Each registered user has a credit account that is used to buy books. The credit account can be recharged by credit card payment. To do this the user has to enter their credit card data and the amount to recharge with. This data is validated and the user has to confirm the transaction before the credit card is charged and the user's credit account is recharged. If a user is logged in, he/she can navigate to an account page that shows the user's credits and the list of books he/she has bought in the past. The links for logging in or out, for registering and to the user's account page are always shown. This also holds for the book search box.

- B) Compare and contrast the suitability of evolutionary process models (in terms of their (3) characteristics) for the design & development of real-time critical systems/applications.
- C) The function "getQuadRoots" given below computes the roots of a quadratic equation $a.x^2 + b.x + c$ (2) =0. The function stores two real roots in *root1 and *root2 and returns the status of validity of roots. It handles four different kinds of cases.
 - (i) When coefficient a is zero irrespective of discriminant
 - (ii) When discriminant is positive
 - (iii) When discriminant is zero
 - (iv) When discriminant is negative.

Only in case (ii) and (iii) the stored roots are valid. Otherwise 0 is stored in roots. The function returns 0 when the roots are valid and -1 otherwise. The function also ensures root1 >= root2

A software test engineer is assigned the job of doing black box testing. He comes up with the following test cases, many of which are redundant. Which of the options listed in table Q.2C provide the set of non-redundant tests using equivalence class partitioning approach from input perspective for black box testing?

Test	Input Set			Expected Output Set		
Case	а	b	с	Root1	Root2	Return Value
T1	0	0	7	0	0	-1
T2	0	1	3	0	0	-1
Т3	1	2	1	-1	-1	0
T4	4	-12	9	1.5	1.5	0
T5	1	-2	-3	3	-1	0
T6	1	1	4	0	0	-1

Table: Q.2C

3)

A)

Design the test cases for the following code snippet using path testing. You are expected to follow (5) the following steps to design an effective test case which have a high probability of revealing defects.

- 1.
- i. Draw the CFG (Control Flow Graph)
- ii. Find the Cyclomatic Complexity using three methods.
- iii. Identify the independent paths (Basic Path Set)

iv. Derive test cases

function Mystery (x, y: integer): integer; Integer s, z; s := 1; z := -1; if x < 0 then s := -1; x := -x; end if; if y < 0 then s := -s; y := −y; end if; while $x \ge 0$ do x:= x - y; z:= z + 1; end while; z := s * z; print(z); return(z); end Mystery. What is W⁵HH principle? Explain. Consider the following code snippet: begin If(a==b) { Statement 1; exit;} Else if (c==d) {Statement 2;} Else {statement 3; exit;} statement 4; end The test cases T1, T2, T3 and T4 given below are expressed in terms of the properties satisfied by the values of variables a, b, c and d. The exact values are not given. T1 : a, b, c and d are all equal T2 : a, b, c and d are all distinct T3 : a = b and c != d T4 : a = b and c = d

B)

C)

(3)

(2)

Which of the test cases are essential to ensure coverage of statements Statement1, Statement2, Statement3 and Statement4?

Draw the activity network representation for the project given in Table Q.4A and compute the following:

(5)

A)

4)

- i. Identify the critical path and its duration for the given project.
- ii. Identify slack time of task T3, T6 and T11.
- iii. Identify latest finish time of Task T5.
- iv. Identify latest start time of Task T10.

Table Q.4A

Task name	Duration(days)	Dependencies	
T1	15	-	
T2	20	-	
Т3	25	T1	
T4	10	T1	
T5	15	T2	
Т6	20	T2	
T7	20	T4,T5	
Т8	30	T4,T5	
Т9	15	T4,T5	
T10	10	T3,T7	
T11	20	T6,T9	

Write the sequence diagram for a Place Order Scenario pertaining to online shopping described (3)below.

A member of a ship who would like to place an order online. The item ordered will be sent to the member either sent by courier or by ordinary mail depending on the member status (VIP, Ordinary membership). Optionally, the shop will send the member a confirmation notice if the member opted for the notification option in the order.

- C) Why is maintenance of a software important? Mention the types of software maintenance with an (2)example for each.
- 5)

A)

B)

Write the class diagram(with methods and attributes, if available in the description) to model the (5)flight and pilot management system described below.

- An airline operates flights. Each airline has an ID. Each flight has an ID a departure airport and an arrival airport: an airport as 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. In a particular moment an aircraft can be landed or airborne. A company has a set of pilots: each pilot has an experience level: 1 is minimum, 3 is maximum. A type of aeroplane may need a particular number of pilots, with a different role (e.g.: captain, co- pilot, navigator): there must be at least one captain and one co-pilot, and a captain must have a level 3.
- B) Classify the following into generalization (G), association (A), aggregation (AG), or composition (C) (3) and represent each statement using class diagram representations:
 - a) A country has a capital city
 - b) A dining philosopher uses a fork
 - c) A file is an ordinary file or a directory file

- d) Files contain records
- f) A polygon is composed of an ordered set of points
- g) A person uses a computer language on a project
- C) Give two examples of information about a problem domain that can be captured in UML activity (2) diagrams, and two ways in which these diagrams can be useful for requirements analysis

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