

2020UGCS039R

Reg. No.

39

Indian Institute of Information Technology Ranchi

Department of Computer Science & Engineering

B. Tech End Semester Examination – Spring Semester 2022-23

Semester: 6th

Course Instructor: Dr. Jayadeep Pati

Course Code: CS-3004

Course Name: Software Engineering

Duration: 3 Hrs.

QUESTION PAPER

Max Marks: 100

Instructions:

- (1). Number in [] indicates marks.
- (2). Any missing data can be assumed suitably.
- (3). Symbols have their usual meaning.
- (4). Non-programmable scientific calculator is allowed.

Section A: Answer all the questions.

- 1 (a) Write the SRS Document whose software requirements are specified in this document. Draw the USE CASE Diagram of the System. Draw Sequence Diagram for at least 3 Use Cases. [10]

Students' Auditorium Management Software.

Various types of social and cultural events are conducted in the students' auditorium. There are two categories of seats: balcony seats and ordinary seats. Normally balcony seats are more expensive in any show.

The manager fixes the price of these two categories of seats depending on the popularity of a show. The show manager also determines the number of balcony and ordinary seats that can be put on sale, since for each show some seats are offered as complimentary gifts to different functionaries of the students' society and to VIPs. The show manager also enters the show dates, the number of shows on any particular date and the show timings.

The spectators book their seats in advance by paying the full ticket price to the authorized sales persons. The spectators indicate the type of the seat and the computer should print out the ticket clearly showing the seat numbers. The spectators' can cancel their booking before 3 clear days of the show. In this case the ticket price is refunded to them after deducting Rs.5/- as the booking charge per ticket. If a ticket is returned within 3 days and 1 day of a show, a booking charge of Rs.10/- is deducted for ordinary tickets and Rs.15/- is deducted for balcony tickets. On the last day of the show, there is a 50% deduction. The system should let the spectators query the availability of different classes of seats.

The show manager can query any time about the percentage of seats booked for various classes of seats and the amount collected in each case. The show manager creates login accounts for authorized sales persons. When any authorized sales person logs in and makes a sale, the computer should record the sales person's id in the sales transaction. This information would help in computing the commission payable to each sales person and also the amount collected by each sales person. These data can be queried by the show manager.

The accounts clerk should be able to enter the various types of expenditures incurred for a show including payment to artists. The computer should prepare a balance sheet for every show and a comprehensive up-to-date balance sheet for every year. The different types of balance sheets should be accessible to the manager only.

Since the software product should be as much low cost as possible, it is proposed that the software should run on a high-end PC and free software such as Linux, mySQL, and Apache web server.

- (b) Draw a Level -0 and Level-1 DFD for the above System. Create Data Dictionary [10]
- 2 (a) Draw DFD (up to Level 2) with Data Dictionary for Following Software. [10]
- A supermarket needs to develop the following software to encourage regular customers. For this, the customer needs to supply his/her residence address, telephone number, and the driving license number. Each customer who registers for this scheme is assigned a unique customer number (CN) by the computer. A customer can present his CN to the checkout staff when he makes any purchase. In this case, the value of his purchase is credited against his CN. At the end of each year, the supermarket intends to award surprise gifts to 10 customers who make the highest total purchase over the year. Also, it intends to award a 22 caret gold coin to every customer whose purchase exceeded Rs.10,000. The entries against the CN are the reset on the day of every year after the prize winners' lists are generated.*
- (b) Draw the structure chart for the above software [5]
- (c) Explain the Use Case Model. How to Represent the Use Cases in UML 2.0? Draw the USE Case Model for the Supermarket Prize Scheme Software Described above. [5]
- 3 (a) Explain the Following Terminology used in Software Engineering [10]
- (i) <<includes>> and <<extends>>
 - (ii) Sequence Diagram and Collaboration Diagram
 - (iii) Structure Chart vs. Flow Chart
 - (iv) Function and Object Oriented Approach
 - (v) Preliminary (or high-level) design and Detailed design
- (b) Answer the Following Questions [10]
- a) State at least two basic differences between control flow-oriented and data flow-oriented design techniques.
 - b) Explain the Scenario, when a prototype of the actual product is preferred in situations.
 - c) Explain the Role of a system analyst.
 - d) Identify at least three reasons in favour of why functional independence is the key factor for a good software design.
 - e) Explain the Logical and Temporal Cohesion.

Section B: Answer all questions

(a) Draw Class Diagram

[10]

- (i) A Student can take up to five Courses.
- (ii) A student needs to enroll in at least one course.
- (iii) Up to 300 students can enroll in a course.
- (iv) An offered subject in a semester should have at least 10 registered students.
- (v) Self-Association Relationship

(b) Identify Classes and Relationships

[5]

- (i) A square is a polygon
- (ii) Every student has a name
- (iii) 100 paisa is one rupee
- (iv) A polygon is composed of an ordered set of points
- (v) Every student is a member of the library

(c) Answer Following Questions.

[5]

- (i) Who Tests Software? Describe their specific roles in testing.
- (ii) Describe Pesticide Effect.
- (iii) What do you mean by Software verification and Software Validation.
- (iv) Describe Test Suite. Why it needs to be optimized?
- (v) Write Test Data for following Program
If $(x > 2) \ x \ += \ 1;$
else $x \ -= \ 1;$

(a) Mark the Following as either True or False. Justify your Answer.

[10]

- (i) Coupling between two modules is nothing but a measure of the degree of dependence between them.
- (ii) A module having high cohesion and low coupling is said to be functionally independent of other modules.
- (iii) In the object-oriented design, the basic abstraction is real-world functions.
- (iv) In the function-oriented design approach, the system state is decentralized and not shared among different functions.
- (v) A DFD captures the order in which the processes (bubbles) operate
- (vi) DFDs enable a software engineer to develop the data domain and functional domain decomposition of the system at the same time.
- (vii) Class diagrams developed using UML can serve as the functional specification of a system.
- (viii) The terms method and operation are equivalent concepts and can be used interchangeably.

- (ix) The Aggregation relationship can be recursively defined, i.e. an object can contain instances of itself.
- (x) The chronological order of the messages in an interaction diagram cannot be determined from an inspection of the diagram.

(b) Draw CFG and Derive Test Case for this Program

[10]

(i)

```
int f1(int x,int y)
{
1 while (x != y){
2   if (x>y) then
3     x=x-y;
4   else y=y-x;
5 }
6 return x;
}
```

(ii)

```
int main()
```

```
{
```

```
  //initializing the 3-D array
```

```
  int arr[2][3][2]
```

```
    = { { { 0, 6 }, { 1, 7 }, { 2, 8 } },
        { { 3, 9 }, { 4, 10 }, { 5, 11 } } };
```

```
  // Printing values of 3-D array
```

```
  for (int i = 0; i < 2; ++i) {
```

```
    for (int j = 0; j < 3; ++j) {
```

```
      for (int k = 0; k < 2; ++k) {
```

```
        printf("Element at arr[%i][%i][%i] = %d\n",
               i, j, k, arr[i][j][k]);
```

```
      }
```

```
    }
```

```
  }
```

```
  return 0;
```

```
}
```

End