

Nirma University

Institute of Technology

Semester End Examination (IR), February 2022

B. Tech. in Computer Science & Engineering, Semester-V

2CS504 SOFTWARE ENGINEERING

Roll /
Exam
No.

Supervisor's
initial with
date

Time: 2 Hours

Max. Marks: 50

- Instructions:
1. Attempt all questions.
 2. Figures to right indicate full marks.
 3. Draw neat sketches wherever necessary.
 4. Attempt questions in sequence only.

- Q-1. Do as directed:** [16]
- A** Explain why it is not sensible to use the iterative waterfall model for [04]
CO1BL2 developing very large software products. Discuss the properties of software development projects for which the iterative waterfall model is not suitable.
- B** Giving reasons for your answer based on the type of system being [06]
CO1BL4 developed, suggest the most appropriate generic software process model that might be used as a basis for managing the development of the following systems:
- i. A data entry system for office staff who have never used computers before. The user interface and user-friendliness are extremely important.
 - ii. A Web-site for an on-line store which has a long list of desired features it wants to add, and it wants a new release with new features to be done very frequently.
 - iii. A well-understood data processing application.
- C** The Automated Guided Vehicle (AGV) System case study is an [06]
CO2BL6 example of a real-time system. Taken in conjunction with the other systems with which it interfaces, the Supervisory System and the Display System, it is also an example of a distributed system of systems. The Supervisory System and the Display System are existing systems to which the AGV System must interface.

An AGV System has the following characteristics:

A computer-based AGV can move along a track in the factory in a clockwise direction, and start and stop at factory stations. The AGV has the following characteristics:

1. A motor, which is commanded to Start Moving and Stop Moving. The motor sends Started and Stopped responses.
2. An arrival sensor to detect when the AGV has arrived at a station, e.g., arrived at station x. If this is the destination station, the AGV should stop. If it is not the destination station, the AGV should continue moving past the station.

3. A robot arm for loading and unloading a part onto and off of the AGV.

The AGV system receives Move commands from an external Supervisory System. It sends vehicle Acknowledgements (Acks) to the Supervisory System indicating that it has started moving, passed a station, or stopped at a station. The AGV system also sends vehicle status to an external Display System every 30 seconds. It is given that the arrival sensor is an event-driven input device and that the motor and arm are passive I/O devices. It is also given that the AGV system communicates with the Supervisory System and Display System by means of messages.

Draw Sequence Diagram for the mentioned problem definition.

- Q-2. Do as directed:** [16]
- A** An automated ticket-issuing system sells rail tickets. Users select [05]
CO2BL3 their destination and input a credit card and a personal identification number. The rail ticket is issued and their credit card account charged. When the user presses the start button, a menu display of potential destinations is activated, along with a message to the user to select a destination. Once a destination has been selected, users are requested to input their credit card. Its validity is checked and the user is then requested to input a personal identifier. When the credit transaction has been validated, the ticket is issued. State the functional & non-functional requirements for the same.
- B** A program validates numeric fields as follows: values less than 10 [05]
CO3BL5 are rejected, values between 10 and 21 are accepted, values greater than or equal to 22 are rejected. Enlist all the equivalence classes and the boundary value test cases.
- C** Explain the role of repository in software configuration management. [06]
CO3BL1 Describe the features of software configuration management.
- OR**
- C** Interpret the differences between a fat-client and a thin-client [06]
CO3BL1 approach to client-server systems development. Your customer wants to develop a system for stock information where dealers can access information about companies and can evaluate various investment scenarios using a simulation system. Each dealer uses this simulation in a different way, according to his or her experience and the type of stocks in question. Suggest a client-server architecture for this system that shows where functionality is located. Justify the client-server system model that you have chosen.
- Q-3. Do as directed:** [18]
- A** Consider the following algorithm: [05]
CO3BL6

```
begin
    int i, j, k, n;
    i = 0;
    while (i <= n) do begin
        p[ i ] = i;
        i = 2;
        while ( i <= n) do begin
```

```

    k = p[ i ];
    j = 1;
    while (a[ p[ j - 1 ] ] > a[ k ]) do begin
        p[ j ] = p[ j - 1 ];
        j = j - 1;
    end while;
    p[ j ] = k;
    i = i + 1;
end while;
i = i + 1;
end while;
end;

```

Perform the following tasks:

- Design the control flow graph for the given code.
- Determine cyclomatic complexity.

B Interpret the differences between static and dynamic metrics in [05]
CO4BL4 quality management. Explain object-oriented metrics in software quality management.

C A project consists of 8 activities named A to N. Consider the following [08]
CO4BL6 table:

Activity	Completion time (in days)	Immediate predecessor activities
A	10	-
B	14	-
C	11	A
D	5	B
E	15	B
F	20	B
G	8	C, D
H	12	C, D
I	16	G
J	10	E, H
K	21	E, H
L	6	E, H
M	9	I, J
N	12	F, L

- Construct activity network so as to satisfy the scheduling requirements shown in the table.
- Find the least time required to complete the whole project.
- Show the calculation of free float time of each activity and based on that calculate the critical path.
- Mention the critical path.

OR

C An on-line multilevel marketing company named New Age [08]
CO4BL6 Distributors has developed an application to maintain profiles of members and record individual member sales. A clerk from New Age sets up a member's profile. The information about members is stored in "Membership" logical file. The clerk can also list members with their profiles and change a member's information. A monthly

customer report is produced that lists all members and calculates their year-to-date sales. Members who exceed total year-to-date sales of Rs 50000 are indicated on the report as Diamond Club members.

This system also stores information about employees of New Age Distributors. A building access system sends a batch update with timecard data indicating when employees swipe their ID cards to enter and leave the building. This data enters the company's application and includes three attributes (employee ID, time of day, and in/out indicator). The employee ID attribute on the input record is validated against an Active Employees logical file maintained in the company's application. If the validation passes, the Employee Hours logical file is updated in the application, and a confirmation message is printed. If the validation fails, no update is made, and an error listing is printed.

All of these data are of average complexity and overall system is moderately complex i.e., assume sum of value adjustment factors is 50. Given the historical data that the organizational average productivity for systems of this type is 9.5 FP/pm. The cost of each function point is Rs 1230. Also, labor rate is of Rs 32,000 per month. Based on the data provided, compute the following:

- Mention all the external inputs, external outputs, external inquiries, internal logical files and external interface files.
- Compute FP for the system.
- Measure the total estimated project cost of the system.

Weighting factors required are provided as follows:

Simple	Average	Complex
3	4	6
4	5	7
3	4	6
7	10	15
5	7	10
