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NPR Nagar, Natham - 624 401, Dindigul Dist, Tamil Nadu. Ph: 04544 - 246500, 501, 502.

CRITERION 2 TEACHING – LEARNING AND EVALUATION		
KEY INDICATOR 2.2 CATERING TO STUDENT DIVERSITY		
Metric No 2.2.1 The institution assesses the learning levels of the students and organizes special Programs for advanced learners and slow learners 2023 - 2024		
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NPR COLLEGE OF ENGG & TECHNOLOGY NATHAM

PRINCIPAL

Dr.R.MARUTHU KANNAN, ME.,Ph.D.,
Principal
NPR College of Engineering and Technology
Natham, Dindigul Dt-624 401

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY

VISION

To develop students with intellectual curiosity and technical expertise to meet the global needs.

MISSION

- To achieve academic excellence by offering quality technical education using best teaching techniques.
- To improve Industry – Institute interactions and expose industrial atmosphere.
- To develop interpersonal skills along with value based education in a dynamic learning environment.
- To explore solutions for real time problems in the society.

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POLICY ON SLOW LEARNERSAND ADVANCED LEARNERS

This policy paper is conceded as the "Policy on Slow Learners and Advanced Learners", of NPR College of Engineering & Technology, Natham, Dindigul. By virtue ofthis Policy the college pronounces its assurance to the proper counsel for the enhancement of the slow learners to be betteron their way of academic and personal life and –advanced learners to be extraordinary in the academic and other extra -curricular activities.

CATEGORIZATION OFNEW BUDDING ENGINEERS

We organized bridge course to familiarize the basic fundamentals and we also conducted one day Motivational Program for all the new budding engineers to expose the opportunities available in the field of Engineering.

The students belonging to first years are taxonomies as Tamil Medium Students / Poor Cut off marks in XII Standard / Poor Knowledge in computing skills.

The purpose of assessment of the learning levels of the students and conduction of activities for them is to help them out for improvement in their academics.

METHODS TO IDENTIFY ADVANCED LEARNERS AND SLOW LEARNERS

Each and Every faculty must deal with different categories of students; some are very intelligent who learn very fast and some are quite weak who learn very slowly. Therefore, it is required to determine the abilities of the students in the class. Based on the ability determined, some students need only guidance and some students need a hard work and regular attention.

A good teaching methodology helps a lot to make either an advanced learner to get more connected with the class or a slow learner he/she may not get away from the concentration.

A student may have his/her own way of getting knowledge and standing with what they had learnt. It varies from one to the other.

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1. To validate a student's capacity he/she will assessed by daily class tests, internal exam and practical sessions as a whole right from first to the final year, which will be taken for grading their internal marks as well.
2. Slow learner and advanced learners would be identified for each subject separately by respective faculty members for at the semesters.
3. The student as an individual is identified as Advanced learners if he/she scores equal to or greater than 60% [>=60%] of marks in his/her internal exams and the students scored less than 60% [<60%] are identified as Slow learners.

SLOW LEARNERS

The slow learners are always lagging in academic performance. They may fail in exams or score poor marks. They need more attention towards their studies to enhance and endure their level of grade.

METHODOLOGIES TO SUPPORT SLOW LEARNERS

Remedial are conducted with appropriate focus on the subject/ topic codes in which the students are found to be slow learners Individual academic counseling is done by concerned subject faculty.

POLICY GUIDELINES FOR SLOW LEARNERS

- Remedial course for slow learners, absentees and students involved in sports activities which help slow learners to improve subject knowledge with the result of catching up with their peers.
- Bridge Course for first year students.
- Orientation and Induction Programme at College and departmental level for freshers.
- Conduct additional classes for the difficult subjects based on the previous semester university results in the curriculum.
- Special attention is given to the students in the remedial classes, who are identified as the slow learners.

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- Slow learners are specially advised and counseled by a staff mentor and the subject expert.
- The students are given with training on communication skills, personality development, time management and motivational sessions.
- Academic and personal counseling are given to the slow learners by the mentor.
- Bilingual explanation and discussions are imparted to the slow learners after the class hours for better understanding.
- Provision of simple and standard lecture notes/course materials and special preparation for the exams will be good.
- Getting the support of the advanced learners to the slow learners in making their learning process more participatory and interesting.
- Encouraging the group learning activities and practical will be useful to the slow learners.

ADVANCED LEARNERS

The Advanced learners are those who can grab concepts faster than others and can make best outputs on various tests they go through. They take into themselves greater responsibilities, by showing interests on both Academic and extra -curricular activities.

METHODOLOGY TO ENCOURAGE ADVANCEDLEARNERS
1. Advanced learners are motivated to strive for higher goals. They are encouraged to organize as well as to participate in Symposium, Workshop, various technical competitions and Seminar to gain Knowledge.
2. Helping them to participate in group discussions, technical quizzes to develop analytical and problem -solving abilities in them and thereby, to improve their presentation skills.
3. Regular Motivation is given to the students to prepare for the Placement, Competitive Exams and Entrepreneurship

METHODOLOGIES TO SUPPORTSLOW LEARNERS

- Advanced learners are motivated to strive for higher goals. They are provided with additional inputs for better career planning and growth through offering special coaching for higher level competitive examinations

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- Encouragement to identify and utilize the web learning resources
- Motivation to participate in interactive activities like debates, group discussion on and out of the syllabi contents and participation in various cultural, extra-curricular and research competitions in and out of the college.
- To provide need -based facility in departments and library to advanced learners.
- Personal Counseling as and when the students turn up for the guidance
- Arrangement of Guest lectures.
- Students enrolled into SWAYAM Courses
- Students are engaged in ICT enabled teaching learning and LMS with considerable responses.
- They are made the supporters to the average and the slow learners.

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NATHAM

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Ref: NPRCET/S&H/BC/2023-24/Odd-01

Date: 03.10.2023

CIRCULAR

This is to inform you that a Bridge Course is planned for first-year students in Mathematics, Physics, Chemistry, and Python, scheduled from 06.10.2023 to 11.10.2023. The objective of this course is to enhance the learning skills and academic performance of first-year engineering students. Students are encouraged to attend and make the most of this opportunity.

PRINCIPAL

Principal
NPR. College of Engineering & Technology
Natham, Dindigul (Dt) 624 401

Copy to:

1. The Principal
2. Office
3. Department Notice Board
4. First Year Co-ordinator

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DEPARTMENT OF SCIENCE & HUMANITIES

CLASS TIMETABLE FOR BRIDGE COURSE 2023-2024

Section - A

Period	1		2	3	4		5	6	7
Time	9.10 to 10.05	10.06 to 10.30	10.31 to 11.20	11.21 to 12.05	12.06 to 12.50	12.51 to 01.35	01.36 to 02.20	02.21 to 03:10	03:11 to 4:00
06.10.2023	MATHS	BREAK	PHYSICS	MATHS	PHYSICS	LUNCH	MATHS	PYTHON	CHEMISTRY
10.10.2023	PHYSICS		MATHS	CHEMISTRY	MATHS		CHEMISTRY	PHYICS	MATHS
11.10.2023	CHEMISTRY		MATHS	PYTHON	MATHS		PYTHON		

Subject Name	Handled by	Department	Hours
Maths	Dr. P. Rani	MAT	08
Physics	Dr. N. Kavitha	PHY	04
Chemistry	Dr. C. Balamurugan	CHEM	04
Python	Dr. K. Ramanan	CSE	05

COLLEGE OF ENGG & TECHNOLOGY * NPR * NATHAM

TIME TABLE INCHARGE
(Dr. A. Kanimozhi)

FIRST YEAR COORDINATOR
(Dr. N. Prabakaran)

PRINCIPAL
(Dr. B. MaruthuKannan)

Principal
NPR College of Engineering and Technology

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DEPARTMENT OF SCIENCE & HUMANITIES

CLASS TIMETABLE FOR BRIDGE COURSE 2023-2024

Section - B

Period	1		2	3	4		5	6	7
Time	9.10 to 10.05	10.06 to 10.30	10.31 to 11.20	11.21 to 12.05	12.06 to 12.50	12.51 to 01.35	01.36 to 02.20	02.21 to 03:10	03:11 to 4:00
06.10.2023	PHYSICS	BREAK	MATHS	PHYSICS	CHEMISTRY	LUNCH	MATHS	PYTHON	CHEMISTRY
10.10.2023	MATHS		PYTHON				MATHS	PHYSICS	MATHS
11.10.2023	MATHS		PHYSICS	MATHS	CHEMISTRY		PYTHON	CHEMISTRY	MATHS

Subject Name	Handled by	Department	Hours
Maths	Mr. K. Yogunath	MAT	08
Physics	Mr. B. Karuppasamy	PHY	04
Chemistry	Dr. N. Nagasubramaian	CHEM	04
Python	Mrs. V. Sujitha	CSE	05

TIME TABLE INCHARGE
(Dr. A. Kanimozhi)

FIRST YEAR COORDINATOR
(Dr. N. Prabakaran)

PRINCIPAL
(Dr. B. Maruthukannan)

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DEPARTMENT OF SCIENCE & HUMANITIES

CLASS TIMETABLE FOR BRIDGE COURSE 2023-2024

Section - C

Period	1		2	3	4		5	6	7
Time	9.10 to 10.05	10.06 to 10.30	10.31 to 11.20	11.21 to 12.05	12.06 to 12.50	12.51 to 01.35	01.36 to 02.20	02.21 to 03:10	03:11 to 4:00
06.10.2023	MATHS	BREAK	PHYSICS	MATHS	PHYSICS	LUNCH	MATHS	PYTHON	CHEMISTRY
10.10.2023	PHYSICS		MATHS	CHEMISTRY	MATHS		CHEMISTRY	PHYICS	MATHS
11.10.2023	CHEMISTRY		MATHS	PYTHON	MATHS		PYTHON		

Subject Name	Handled by	Department	Hours
Maths	Mr. D. Lakshmi	MAT	08
Physics	Dr. P. S. Satheeshkumar	PHY	04
Chemistry	Dr. Dr. N. Prabakaran	CHEM	04
Python	Mr. P. Manivel Pandian	CSE	05

TIME TABLE INCHARGE
(Dr. A. Kanimozhi)

FIRST YEAR COORDINATOR
(Dr. N. Prabakaran)

PRINCIPAL
(Dr. B. Maruthukannan)
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DEPARTMENT OF SCIENCE & HUMANITIES

CLASS TIMETABLE FOR BRIDGE COURSE 2023-2024

Section - D

Period	1		2	3	4		5	6	7
Time	9.10 to 10.05	10.06 to 10.30	10.31 to 11.20	11.21 to 12.05	12.06 to 12.50	12.51 to 01.35	01.36 to 02.20	02.21 to 03:10	03:11 to 4:00
06.10.2023	CHEMISTRY	BREAK	MATHS	PHYSICS	CHEMISTRY	LUNCH	MATHS	PYTHON	PHYSICS
10.10.2023	MATHS		PYTHON				MATHS	PHYSICS	MATHS
11.10.2023	MATHS		PHYSICS	MATHS	CHEMISTRY		PYTHON	CHEMISTRY	MATHS

Subject Name	Handled by	Department	Hours
Maths	Mrs. C. Yogitha	MAT	08
Physics	Mr. V. Vijayanarayanan	PHY	04
Chemistry	Dr. C. Balamurugan	CHEM	04
Python	Mrs. K. Rajalakshmi	CSE	05

TIME TABLE INCHARGE
(Dr. A. Kanimozhi)

FIRST YEAR COORDINATOR
(Dr. N. Prabakaran)

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INSTITUTION ASSESSMENT LEARNING LEVEL

Student

Internal Examination

Result Analysis

Internal Marks >=60

Internal Marks <60

Advanced Learners

- ✓ Utilizing the Web Learning Resources
- ✓ Enrollment of SWAYAM Courses
- ✓ Placement Training Class
- ✓ Personal Counseling
- ✓ Carrier Planning and Special Coaching for Higher level competitive examinations
- ✓ Participation of various technical competitions.
- ✓ Supporters to the average and the slow learners.
- ✓ Coordinators of Symposium, Workshops and Guest Lectures.

Outcome

- ✓ Placement
- ✓ Higher Studies in reputed institution.
- ✓ Entrepreneurs

Slow Learners

- ✓ Remedial Class
- ✓ Bridge Course for first year students
- ✓ Motivational Program
- ✓ Academic and Personal Counseling by Mentor
- ✓ Bilingual explanation and discussions after the class hours for better understanding.
- ✓ Simplified Lecture Notes
- ✓ Training on communication skills, personality development, time management.
- ✓ Group learning activities.

Outcome

- ✓ Slow learners become advanced learners.
- ✓ Improved subject knowledge with the result of catching up with their peers.
- ✓ Placement
- ✓ Continuous improvement in University Examinations

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Ref: NPRCET/CSE/REMEDIAL/2023-2024-EVEN-1

Date : 12.02.2024

CIRCULAR

This is to inform that, Remedial Classes will be conducted for the slow learners of III Year of Computer Science and Engineering Students to improve their learning skills and academic performance. The Slow learners were identified based on the performance of the **First Internal Test**. The Students concerned are advised to attend the remedial classes from 19.02.2024 onwards at 4.30 p.m. to 5.30 p.m.

HoD - CSE

Copy to

1. The Principal
2. Head of the Department
3. Department Faculty room
4. II,III and IV Year CSE class rooms

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ACADEMIC YEAR 2023-2024

INTERNAL TEST - I REMEDIAL CLASS TIMETABLE FOR SLOW LEARNERS

Year / Sem : III/ V **Batch :** 2021-2025

Venue : III CSE Classroom **Time:** 4.30 p.m. to 5.30 p.m.

Date	Day	Subject Name	Faculty Name
19.02.2024	Monday	Object Oriented Software Engineering	Mrs.V.Sujitha
20.02.2024	Tuesday	Embedded Systems and IoT	Mr.S.Allwyn Anand
21.02.2024	Wednesday	Introduction to Industrial Engineering	Mrs.S.Janet Vidyaa Nancy
22.02.2024	Thursday	Big Data Analytics	Mr.R.Senthil Kumar
23.02.2024	Friday	App Development	Mrs.J.LillyRoseline Mary
24.02.2024	Saturday	Network Security	Mr.P.Manivel Pandiyan
26.02.2024	Monday	UI and UX Design	Mrs.C.Kalpana
27.02.2024	Tuesday	Industrial Safety	Mr.M.ArockiaIrudayaraja
28.02.2024	Wednesday	Object Oriented Software Engineering	Mrs.V.Sujitha
29.02.2024	Thursday	Embedded Systems and IoT	Mr.S.Allwyn Anand
01.03.2024	Friday	Introduction to Industrial Engineering	Mrs.S.Janet Vidyaa Nancy
02.03.2024	Saturday	Big Data Analytics	Mr.R.Senthil Kumar

Timetable In-Charge **HoD**

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ACADEMIC YEAR 2023-2024

INTERNAL TEST - I MARKS

Year / Sem: III/VI **Batch:** 2021-2025

Subject Code /Course Code: CCS356 **Subject Name**: Object Oriented Software Engineering

S/N.	Register Number	Name of the Student	Internal Test - I
1.	920821104002	Ajaykumar K	81
2.	920821104003	Anbarasan P	81
3.	920821104004	Anbarasu S	76
4.	920821104005	Anbulingam E	36
5.	920821104006	Apsara Jasmine S	81
6.	920821104007	Arasu Thanga Pandi M	89
7.	920821104008	Arusha Banu A	94
8.	920821104009	Baby Shalini C	83
9.	920821104010	Bellarmine Joshi V	90
10.	920821104011	Bharathi S	94
11.	920821104012	Bhuvaneshwaran S	88
12.	920821104013	Devadharshini R S	87
13.	920821104014	Dhanush M	83
14.	920821104015	Dharani T	88
15.	920821104016	Dharinish K	52
16.	920821104017	Dharshini M	92
17.	920821104018	Durga Gnana Devi S	90
18.	920821104019	Fahmitha Sirin N	94
19.	920821104020	Frossekhan M	86
20.	920821104021	Gantharaja M	70
21.	920821104022	Gokulapriyan K	71
22.	920821104023	Harish T	78
23.	920821104024	Jayasurya S A	88
24.	920821104025	Jothimani P	40
25.	920821104026	Jothiprakash M	63
26.	920821104027	Karthikeyan D K	80
27.	920821104028	Karthikeyan M	88
28.	920821104029	Keerthi Haran R	89
29.	920821104030	Madhesh G	87
30.	920821104031	Madhumitha J	40
31.	920821104033	Natchathira M	93
32.	920821104034	Naveen S	50
33.	920821104035	Pavithra J	80
34.	920821104036	Phavaneshwar K	45
35.	920821104037	Pranov M	63
36.	920821104038	Ragul R	51
37.	920821104039	Rathis Kanna R	63

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S/N.	Register Number	Name of the Student	Internal Test - I
38.	920821104040	Roobala V	92
39.	920821104041	Sahulhameed U	84
40.	920821104042	Sankara Dinesh A	92
41.	920821104043	Shanmugapriya V	66
42.	920821104044	Sheeba S	68
43.	920821104045	Sheebaa V	52
44.	920821104046	Sheik Abdul Basith S	78
45.	920821104047	Shri Harini V	89
46.	920821104048	Sibidharani K	88
47.	920821104049	Sivakumar R	82
48.	920821104050	Siva Subramanian N	86
49.	920821104052	Sri Sudharsana Lakshmi D	81
50.	920821104053	Sumitha V	94
51.	920821104054	Suresh Kannan M	80
52.	920821104055	Surya Prakash S	89
53.	920821104056	Susmitha N	93
54.	920821104057	Theshan Banu S	95
55.	920821104059	Yuvashri A	90
56.	920821104301	Bala Anandhan R	87
57.	920821104302	Krishna Kumar T	81
58.	920821104303	Madhan T	86
59.	920821104304	Sirajudeen N	44
60.	920821104701	Jeganash Begam.N	50

Faculty In-Charge **HoD**

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ACADEMIC YEAR 2023-2024

NAME LIST FOR ADVANCED LEARNERS - INTERNAL TEST – I

CCS356-OBJECT ORIENTED SOFTWARE ENGINEERING

Year / Sem: III/VI **Batch:** 2021-2025

S/N.	Register Number	Name of the Student
1.	920821104002	Ajaykumar K
2.	920821104003	Anbarasan P
3.	920821104004	Anbarasu S
4.	920821104006	Apsara Jasmine S
5.	920821104007	Arasu Thanga Pandi M
6.	920821104008	Arusha Banu A
7.	920821104009	Baby Shalini C
8.	920821104010	Bellarmine Joshi V
9.	920821104011	Bharathi S
10.	920821104012	Bhuvaneshwaran S
11.	920821104013	Devadharshini R S
12.	920821104014	Dhanush M
13.	920821104015	Dharani T
14.	920821104017	Dharshini M
15.	920821104018	Durga Gnana Devi S
16.	920821104019	Fahmitha Sirin N
17.	920821104020	Frossekhan M
18.	920821104021	Gantharaja M
19.	920821104022	Gokulapriyan K
20.	920821104023	Harish T
21.	920821104024	Jayasurya S A
22.	920821104026	Jothiprakash M
23.	920821104027	Karthikeyan D K
24.	920821104028	Karthikeyan M
25.	920821104029	Keerthi Haran R
26.	920821104030	Madhesh G
27.	920821104033	Natchathira M
28.	920821104035	Pavithra J
29.	920821104037	Pranov M
30.	920821104039	Rathis Kanna R
31.	920821104040	Roobala V
32.	920821104041	Sahulhameed U
33.	920821104042	Sankara Dinesh A
34.	920821104043	Shanmugapriya V
35.	920821104044	Sheeba S
36.	920821104046	Sheik Abdul Basith S

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37.	920821104047	Shri Harini V
S/N.	**Register Number**	**Name of the Student**
38.	920821104048	Sibidharani K
39.	920821104049	Sivakumar R
40.	920821104050	Siva Subramanian N
41.	920821104052	Sri Sudharsana Lakshmi D
42.	920821104053	Sumitha V
43.	920821104054	Suresh Kannan M
44.	920821104055	Surya Prakash S
45.	920821104056	Susmitha N
46.	920821104057	Theshan Banu S
47.	920821104059	Yuvashri A
48.	920821104301	Bala Anandhan R
49.	920821104302	Krishna Kumar T
50.	920821104303	Madhan T

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ACADEMIC YEAR 2023-2024

NAME LIST FOR SLOW LEARNERS - INTERNAL TEST – I

CCS356-OBJECT ORIENTED SOFTWARE ENGINEERING

Year / Sem: III/VI **Batch:** 2021-2025

S/N.	Register Number	Name of the Student
1.	920821104005	Anbulingam E
2.	920821104016	Dharinish K
3.	920821104025	Jothimani P
4.	920821104031	Madhumitha J
5.	920821104034	Naveen S
6.	920821104036	Phavaneshwar K
7.	920821104038	Ragul R
8.	920821104045	Sheebaa V
9.	920821104304	Sirajudeen N
10.	920821104701	Jeganash Begam.N

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
ACADEMIC YEAR 2023-2024

ATTENDANCE FOR SLOW LEARNERS – INTERNAL TEST – I

CCS356-OBJECT ORIENTED SOFTWARE ENGINEERING

Year / Sem: III/VI **Batch:** 2021-2025

S/N.	Register Number	Name of the Student	19.02.2024
1.	920821104005	Anbulingam E	/
2.	920821104016	Dharinish K	/
3.	920821104025	Jothimani P	AB
4.	920821104031	Madhumitha J	/
5.	920821104034	Naveen S	/
6.	920821104036	Phavaneshwar K	/
7.	920821104038	Ragul R	/
8.	920821104045	Sheebaa V	/
9.	920821104304	Sirajudeen N	/
10.	920821104701	Jeganash Begam.N	/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

REMEDIAL CLASSES & IMPLEMENTATION

PROGRAMME : Computer Science and Engineering
SEMESTER: VI

REMEDIAL CLASSES	
Subject	**CCS356-Object Oriented Software Engineering**
Class Involved	Semester 6
Faculty in-charge	Mrs.V.Sujitha, AP/CSE
Reason for arranging the remedial Class	Weak students identified after Internal Test 1
Contents to be Taught	Unit 1 and Unit 2
Date and venue of the Class	19.02.2024 & MBLH209 Class Room
Faculty to ensure the Class Room is free and the teaching aids are arranged for the Class	Yes
Information to all Students of the Class	Yes
HOD To Ensure there are no other Classes for the students involved on this Date/Time	No other classes
Approved by HOD	

REMEDIAL CLASSES IMPLEMENTATION	
% Attendance of the REMEDIAL Class	90%.
Attendance details is forwarded to HOD	Yes
Verification by HOD	

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ACADEMIC YEAR 2023-2024

UNIVERSITY MARKS

Year / Sem: III/VI **Batch:** 2021-2025

Subject Code /Course Code: CCS356 **Subject Name**: Object Oriented Software Engineering

S/N.	Register Number	Name of the Student	University Result
1.	920821104002	Ajaykumar K	A
2.	920821104003	Anbarasan P	A
3.	920821104004	Anbarasu S	A
4.	920821104005	Anbulingam E	B
5.	920821104006	Apsara Jasmine S	A
6.	920821104007	Arasu Thanga Pandi M	A
7.	920821104008	Arusha Banu A	A+
8.	920821104009	Baby Shalini C	A+
9.	920821104010	Bellarmine Joshi V	A
10.	920821104011	Bharathi S	A+
11.	920821104012	Bhuvaneshwaran S	A
12.	920821104013	Devadharshini R S	A
13.	920821104014	Dhanush M	A
14.	920821104015	Dharani T	A
15.	920821104016	Dharinish K	B+
16.	920821104017	Dharshini M	A
17.	920821104018	Durga Gnana Devi S	A+
18.	920821104019	Fahmitha Sirin N	A+
19.	920821104020	Frossekhan M	A
20.	920821104021	Gantharaja M	A
21.	920821104022	Gokulapriyan K	A
22.	920821104023	Harish T	A
23.	920821104024	Jayasurya S A	A
24.	920821104025	Jothimani P	U
25.	920821104026	Jothiprakash M	B+
26.	920821104027	Karthikeyan D K	A
27.	920821104028	Karthikeyan M	A
28.	920821104029	Keerthi Haran R	A
29.	920821104030	Madhesh G	A
30.	920821104031	Madhumitha J	B+
31.	920821104033	Natchathira M	A
32.	920821104034	Naveen S	B+
33.	920821104035	Pavithra J	A
34.	920821104036	Phavaneshwar K	B+
35.	920821104037	Pranov M	A
36.	920821104038	Ragul R	B+
37.	920821104039	Rathis Kanna R	B+
38.	920821104040	Roobala V	A+
39.	920821104041	Sahulhameed U	A
40.	920821104042	Sankara Dinesh A	A+

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S/N.	Register Number	Name of the Student	University Result
41.	920821104043	Shanmugapriya V	B+
42.	920821104044	Sheeba S	B
43.	920821104045	Sheebaa V	B
44.	920821104046	Sheik Abdul Basith S	B
45.	920821104047	Shri Harini V	A
46.	920821104048	Sibidharani K	A
47.	920821104049	Sivakumar R	A
48.	920821104050	Siva Subramanian N	A
49.	920821104052	Sri Sudharsana Lakshmi D	A+
50.	920821104053	Sumitha V	O
51.	920821104054	Suresh Kannan M	A
52.	920821104055	Surya Prakash S	A
53.	920821104056	Susmitha N	A
54.	920821104057	Theshan Banu S	A
55.	920821104059	Yuvashri A	A
56.	920821104301	Bala Anandhan R	A
57.	920821104302	Krishna Kumar T	B+
58.	920821104303	Madhan T	A
59.	920821104304	Sirajudeen N	B+
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ACADEMIC YEAR 2023-2024

REMEDIAL CLASS ANALYSIS - SLOW LEARNERS

Year / Sem: III/VI **Batch:** 2021-2025

Subject Code /Course Code: CCS356 **Subject Name:** Object Oriented Software Engineering

S/N.	Register Number	Name of the Student	University Result	Number of Students Passed / Failed
1	920821104005	Anbulingam E	B	PASSED:9 FAILED:1
2	920821104016	Dharinish K	B+	
3	920821104025	Jothimani P	U	
4	920821104031	Madhumitha J	B+	
5	920821104034	Naveen S	B+	
6	920821104036	Phavaneshwar K	B+	
7	920821104038	Ragul R	B+	
8	920821104045	Sheebaa V	B+	
9	920821104304	Sirajudeen N	B+	
10	920821104701	Jeganash Begam.N	B+	

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Sample Subject materials for Slow Learners

CCS356- Object Oriented S/W Engineering

UNIT - I

Software Process and Agile Development

Introduction to Software Engineering:

Software engineering is a discipline in which theories, methods and tools are applied to develop professional software product.

In software engineering the systematic and organized approach is adopted.

Based on the nature of the problem and development constraints various tools and techniques are applied in order to develop quality S/W.

The definition of software engineering is based on two terms.

i) Discipline

ii) Product

Defining software:

It is nothing but a collection of computer programs and related documents that are intended to provide desired features, functionalities and better performance

Software products may be:

1. Generic
2. custom

Software characteristics:

The characteristics of software are:

i) s/w is engineered, not manufactured
ii) s/w does not ware out.
iii) Most s/w is custom built rather than being assembled from components.

categories of software:

Based on the complex growth of software it can be classified into following categories:

1. System software
2. Application software
3. Engineering/ scientic s/w
4. Embedded software
5. web applications
6. Artificial Intelligence s/w

Goals and objective of software

1. satisfy user requirements
2. High reliability
3. Low maintenance costs
4. Delivery on time
5. Low production costs
6. High performance
7. Ease of reuse

Software Process :

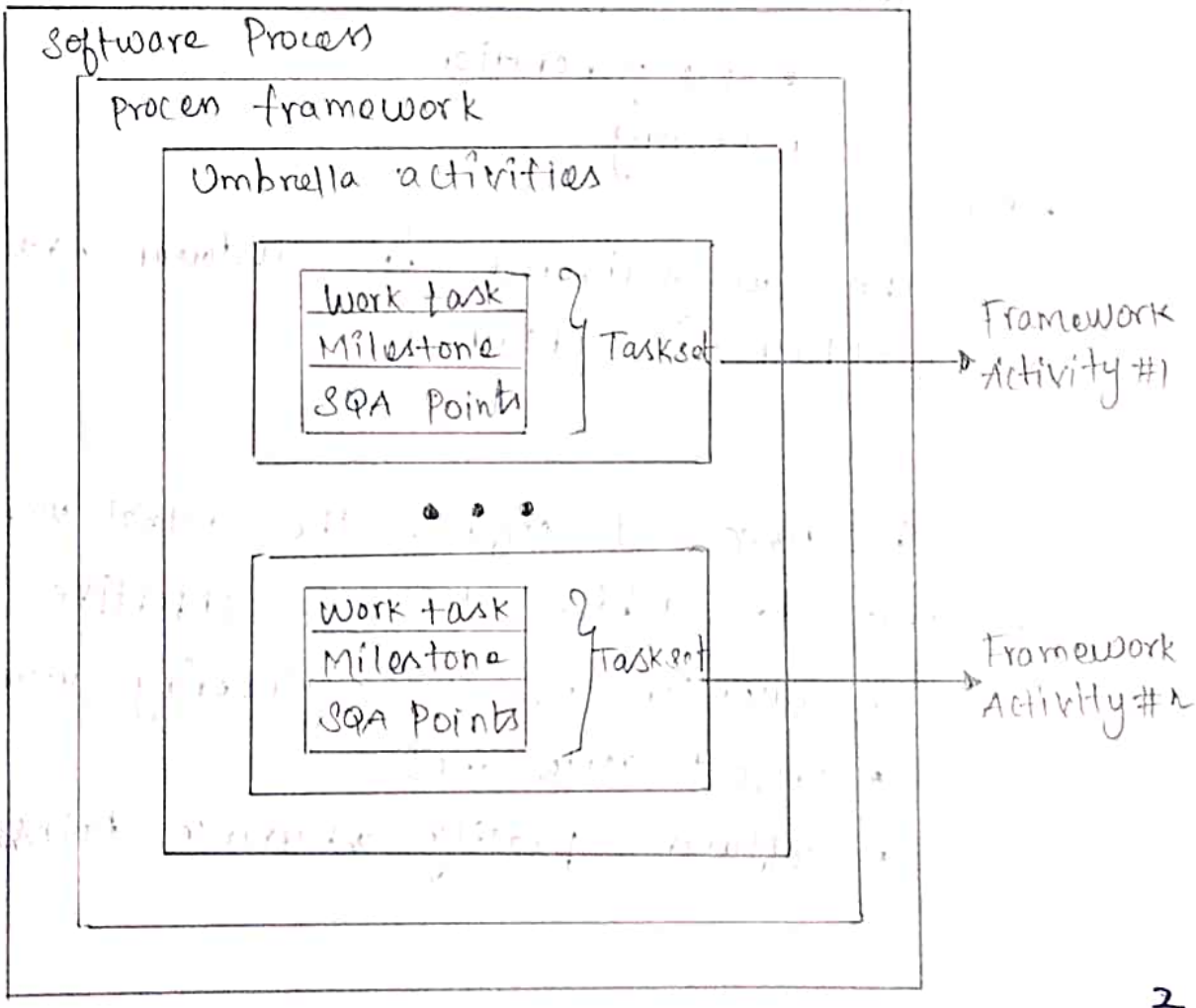
Software process can be defined as the structured set of activities that are required to develop the software system.

The fundamental activities are :

i) specification
ii) Design and implementation
iii) Validation
iv) Evolution

Common Process Framework :

The process framework is required for representing the common process activities.



Process framework Activities:

- Communication

By communicating customer requirement gathering is done

- Planning

Establishes engineering work plan, describes technical risks, lists resource requirements, work products produced and defines work schedule

- Modeling:

The s/w model is prepared by

- Analysis of requirement
- Design

- Construction

The s/w design is mapped into a code by:

- Code generation
- Testing

- Deployment

The s/w delivered for customer evaluation and feedback is obtained.

Task sets:

The task set defines the actual work done in order to achieve the s/w objective

- collection of s/w engineering work tasks
- project milestones
- software quality assurance points.

Umbrella Activities:

The umbrella activities occur throughout the process.

They focus on project management, tracking and control.

The umbrella activities are

1. s/w project tracking and control
2. Risk Management
3. s/w quality assurance
4. Formal technical reviews
5. software configuration management
6. work product preparation and production
7. Reusability management
8. Measurement.

Capability Maturity Model (CMM)

The SEI has developed a comprehensive process meta-model emphasizing process maturity.

It is predicated on a set of system and software capabilities that should be present when organizations reach different levels of process capability and maturity.

The CMM is used in assessing how well an organization's processes allow to complete and manage new s/w projects.

Various process maturity levels are:

Level 1 : Initial :

Few processes are defined and individual efforts are taken.

Level 2 : Repeatable :

To track cost schedule and functionality of basic project management processes are established.

Level 3 : Defined

The process is standardized, documented and followed.

Level 4 : Managed

Both the sw process and product are quantitatively understood and controlled using detailed measures.

Level 5 : Optimizing

to plan & implement changes

Perspective and specialized Process Models:

Definition:

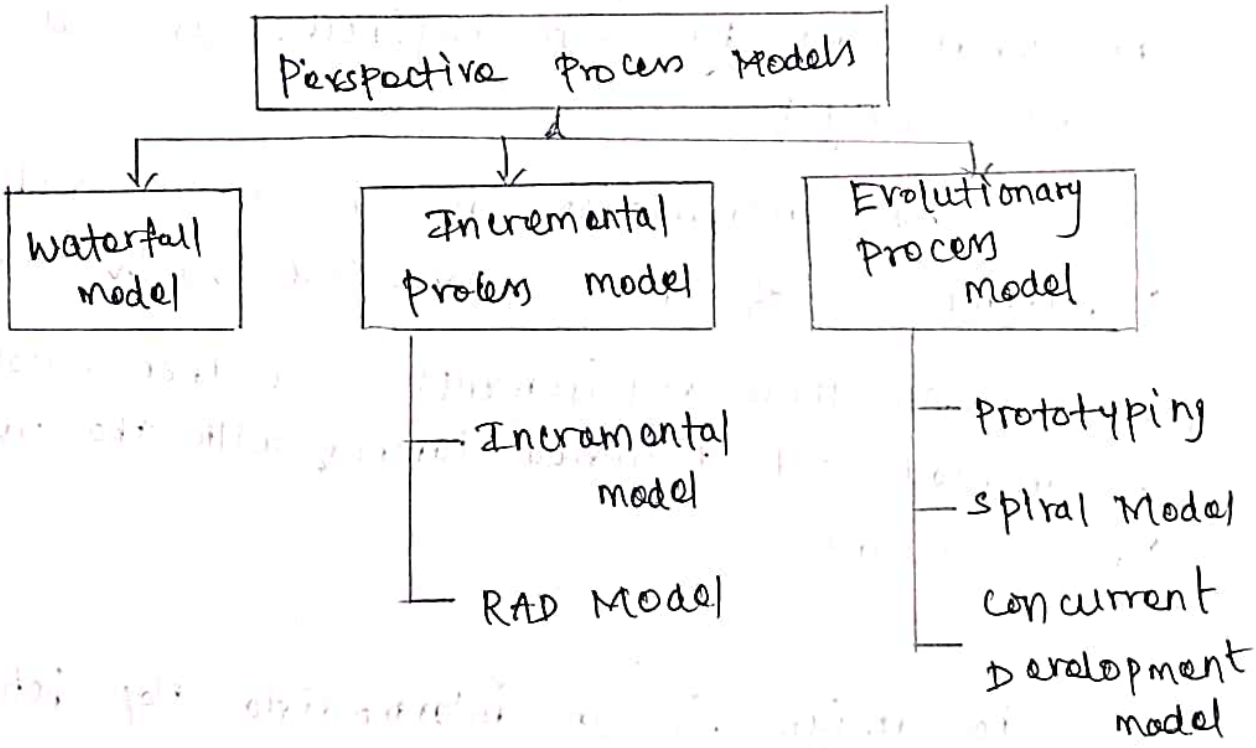
The process model can be defined as the abstract representation of process.

The appropriate process model can be chosen based on abstract representation of process.

It is also known as software development life cycle model or software paradigm.

In this model various activities are carried out in some specific sequence to make the desired s/w product.

various perspective process models are:



Waterfall Model:

It is also called as 'linear-sequential Model' or 'classic life cycle model.

It is the oldest software paradigm.

This model suggests a systematic sequential approach to s/w development.

The model starts with requirements gathering phase.

Then progresses through analysis, design, coding testing and maintenance.

Requirement Analysis and gathering:

The basic requirements of the system must be understood by s/w engineer, who is also called analyst.

The information domain, function, behavioural requirements of the system are understood.

All these requirements are then well documented and discussed further with the customer for reviewing.

Design:

The design is an intermediate step between requirement analysis and coding.

Design focuses on program attributes such as:

- Data structure

- s/w architecture
- Interface representation
- Algorithmic details

The requirements are translated in some easy to represent form using which coding can be done effectively and efficiently.

Coding:

It is the step in which design is translated into machine-readable form

If design done in sufficient detail then coding can be done effectively.

Programs are created in this Phase

Testing:

It begins when coding is done.

while performing testing the major focus is on logical internal of the s/y.

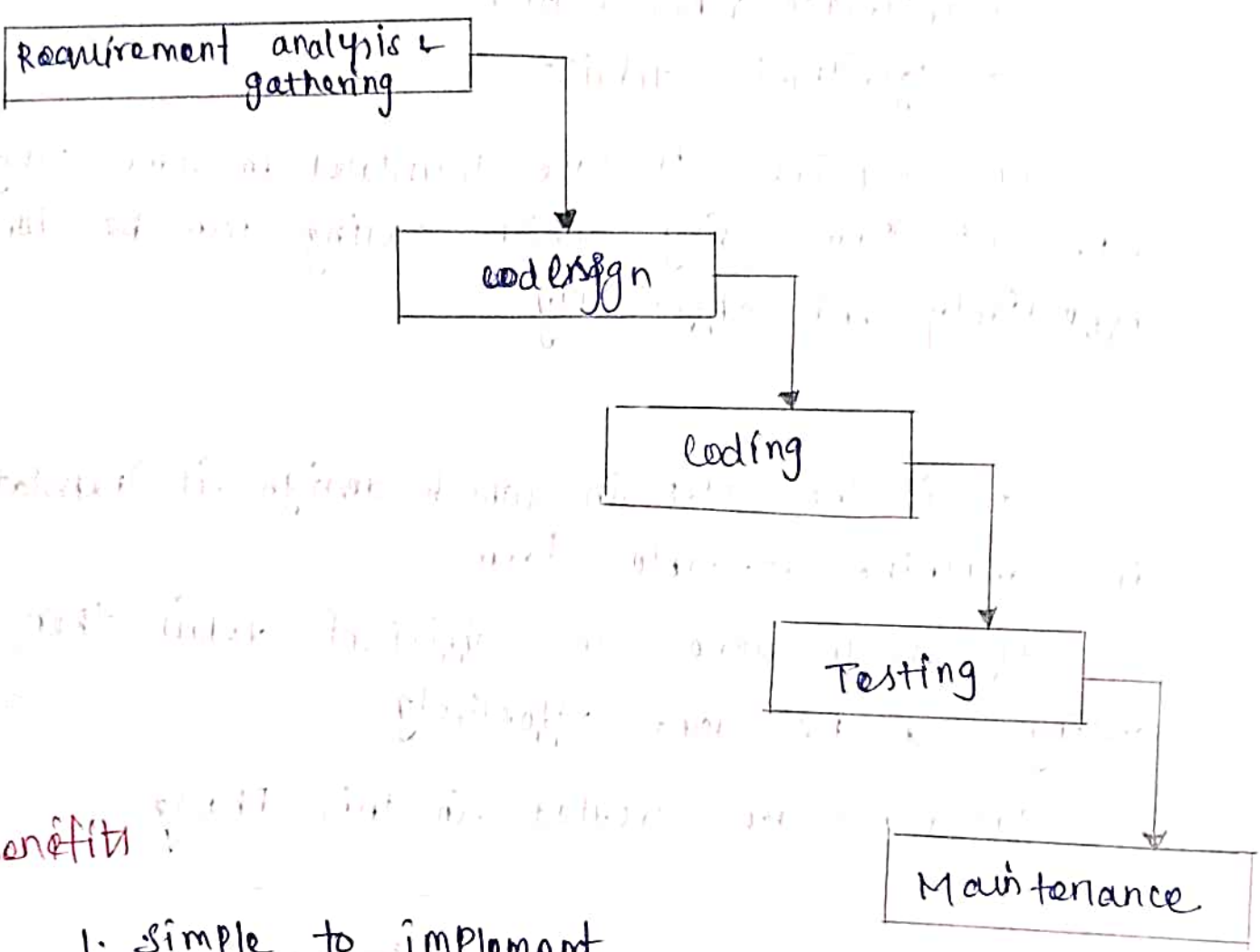
It ensures execution of all the path, functional behaviours.

The purpose of testing is to concorel errors, fix the bugs and meet the customer requirements.

Maintenance:

It is the longest life cycle phase.

When the s/y is installed and put in practical use then error may get introduced, correcting such errors and putting it in use is the major purpose of maintenance activity.



Benefits :

1. Simple to implement
2. Small systems.

Drawbacks :

1. Difficult to follow the sequential flow in s/w development process.
2. the working model of the project only released at the end.
3. Linear nature of waterfall model increase blocking states. It may cause long waiting time.

Incremental Process Model

In this model, the initial model with limited functionality is created for users understanding about the software product and then this model is refined and expanded in later releases.

Incremental Model:

The incremental model has same phases that are in water fall model.

But it is iterative in nature.

The incremental model has following phases

1. Analysis
2. Design
3. Code
4. Test

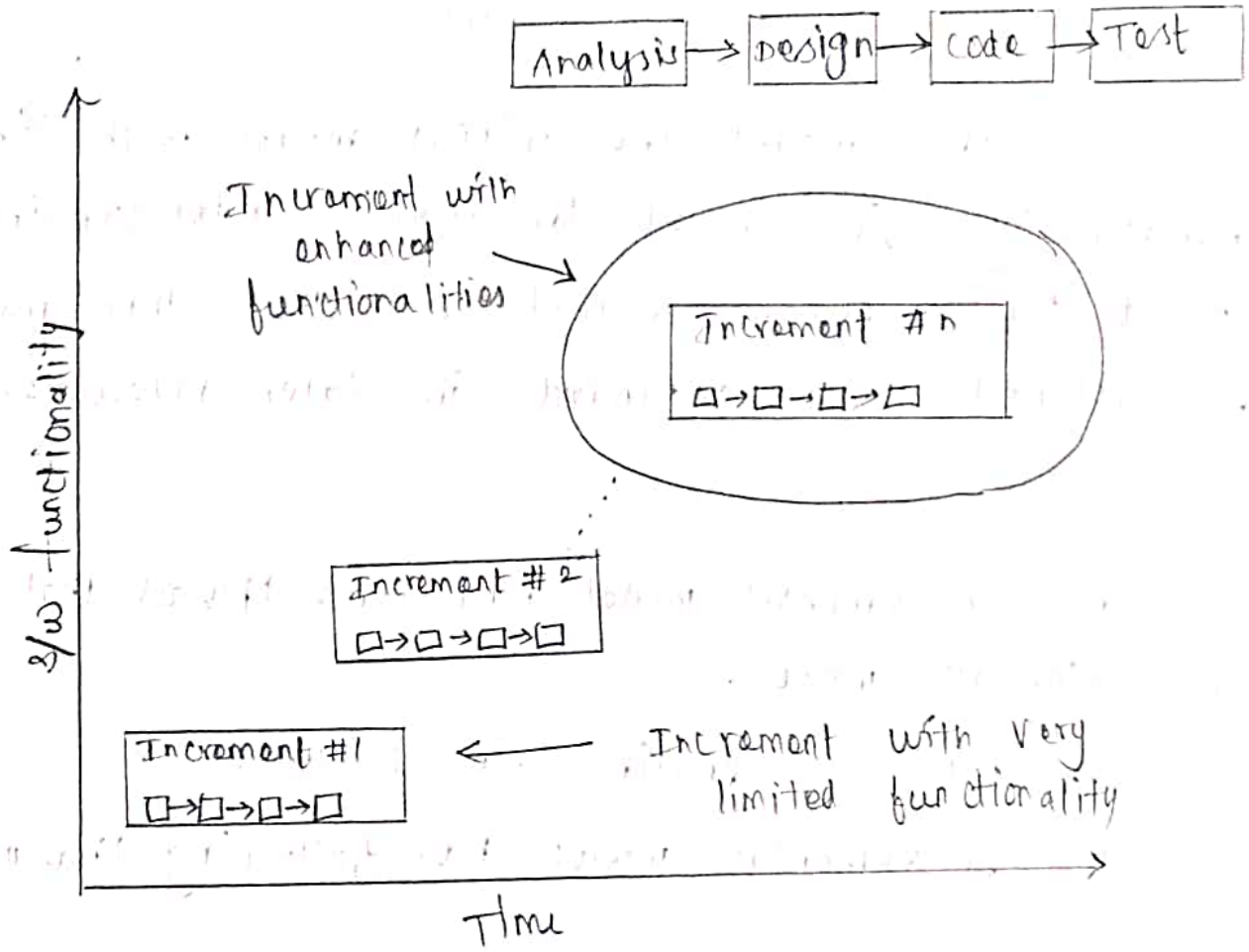
The incremental model delivers series of releases to the customer.

The releases are called increments.

More and more functionality is associated with each increment.

The first increment is called core product.

In this release the basic requirements are implemented and then in subsequent increments new requirements are added.



The word procesing software package can be considered as an example of incremental model.

Merit of Incremental Model:

1. It can be adopted, when there are less number of people involved in the project.
2. Technical risks can be managed with each increment.
3. For a very small time span, atleast core Product can be delivered to the customer.

RAD MODEL

The RAD Model is a type of incremental Process model in which there is extremely short development cycle.

When the requirements are fully understood and the component based construction approach is adopted then the RAD Model is used.

using this model the fully functional system can be developed within 60 to 90 days.

Various phases in RAD Model are:

1) Requirement Gathering
2) Analysis and Planning
3) Design
4) Build
5) Construction
6) Deployment

Requirement Gathering:

the developers communicate with the users of the s/y and understand the busines process and requirements of the s/w system.

Analysis and Planning:

The analysis on the gathered requirements is made and a planning for various s/w development activities is done.

Design:

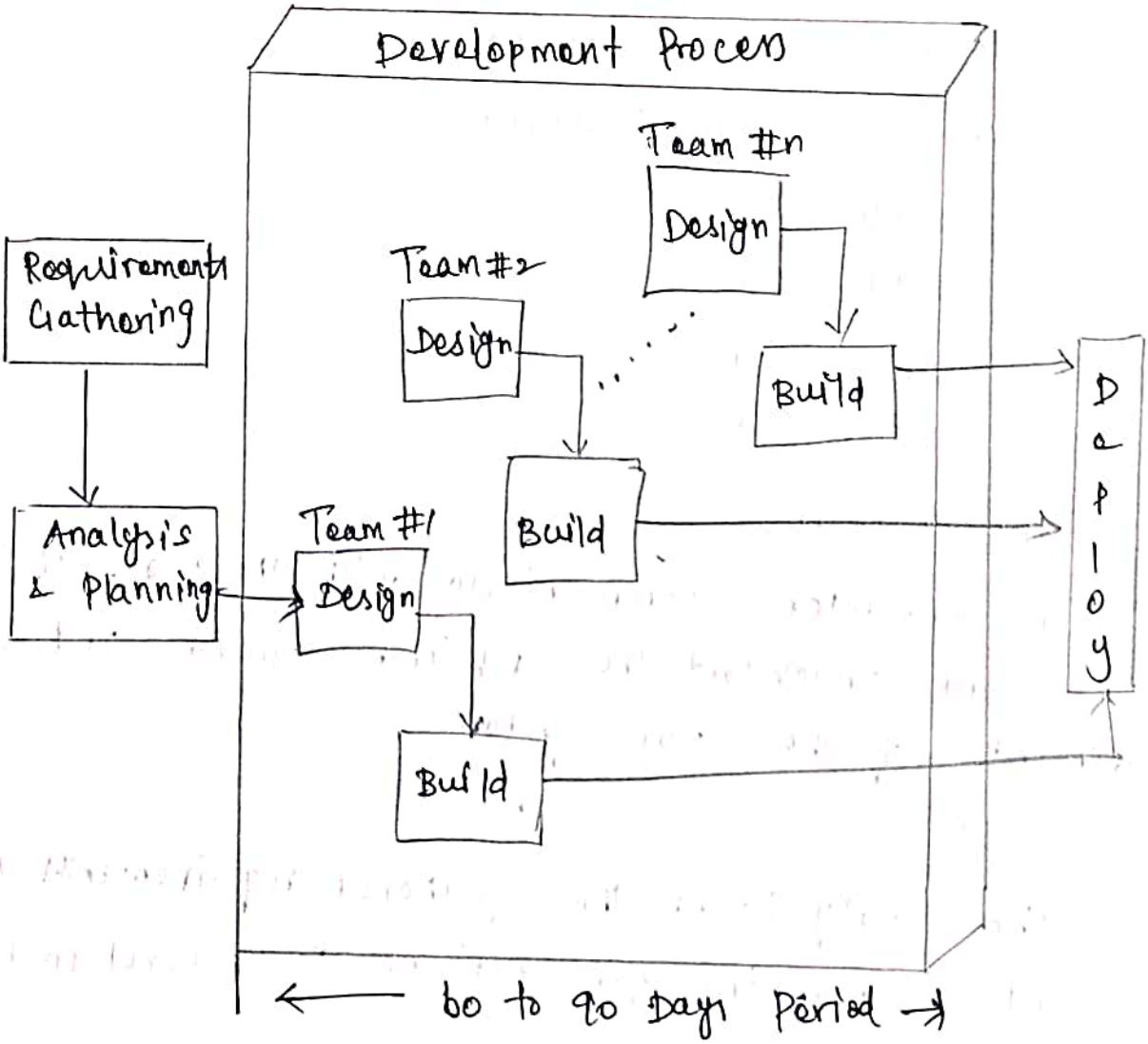
During the design phase various models are created.

Build:

It is an activity in which using the existing s/w components and automatic code generation tool the implementation code is created for the s/w system

Deployment:

Finally, the deployment of all the s/w components is carried out.



Drawbacks: Refer book

Evolutionary Process Model

While developing the s/w system, it is often needed to make modifications in earlier development phases.

In such cases, the iterative approach needs to be adopted.

The evolutionary process model is iterative model.

Prototyping:

In this model initially the requirement gathering is done.

Developer and customer define overall objectives, identify the areas needing more requirements.

Then the quick design is Prepared.

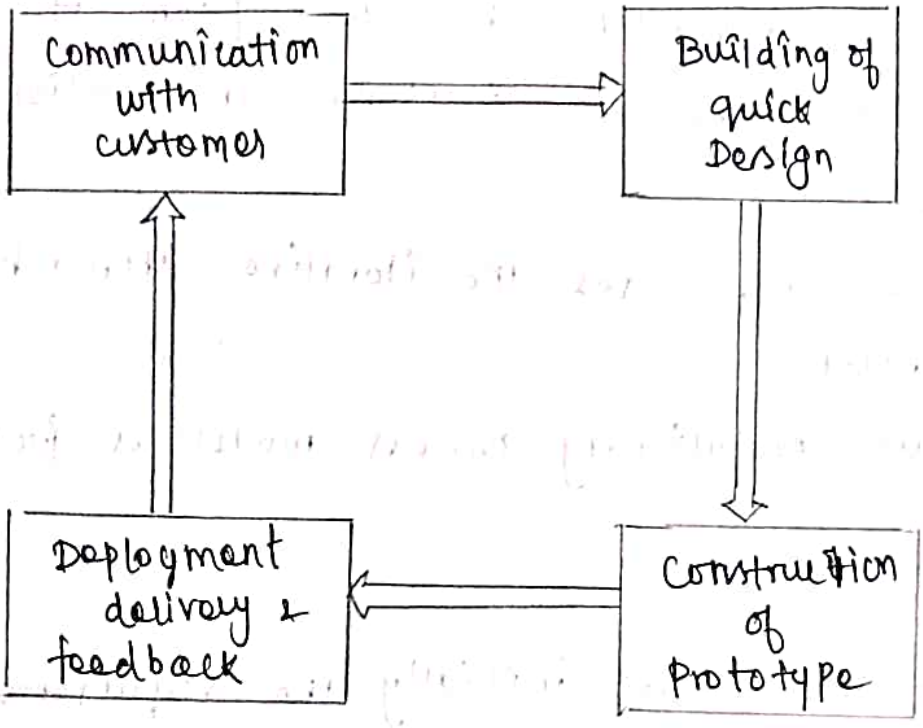
From the quick design a Prototype is prepared.

customer or user evaluates the prototype in order to refine the requirements.

Iteratively prototype is tuned for satisfying customer requirements.

Thus prototype is important to identify the s/w requirements.

When working prototype is built, developer use existing program fragments or program generates to throw away the prototype and rebuild the s/y to high quality.



Drawbacks :

1. The first ression may have some compromises.

2 In the first session itself, customer often wants "few fixes" rather than rebuilding of the system.

3. Sometimes developer may make implementation compromises to get prototype working quickly.

Spiral Model:

This model passes the iterative nature of prototyping model and controlled the systematic approaches of the linear sequential model.

In this model s/w is developed in series of increments.

The spiral model is divided into a number of framework activities.

These framework activities are denoted by task regions.

Usually there are six regions.

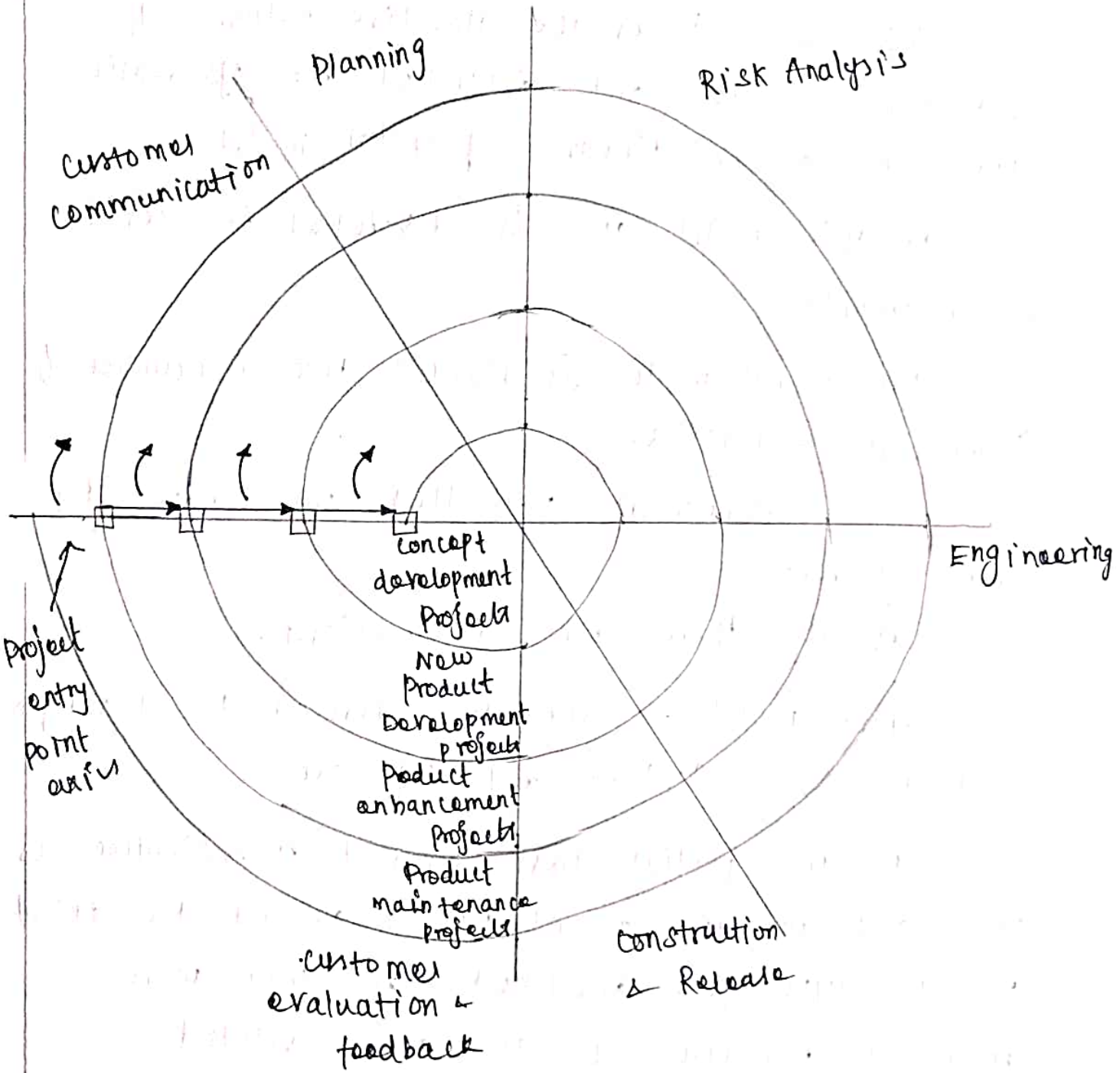
Spiral model is realistic approach, to development of large-scale systems and software.

In the initial pass, product specification is built and in subsequent passes around the spiral the prototype gets developed. and then more improved versions of s/w gets developed.

During the planning phase, the cost and schedule of s/w can be planned and adjusted based on feedback obtained from customer evaluation.

In spiral model, project entry point axis is defined.

This axis represents starting point for different types of projects.



Task Regions:

i) customer Communication:

In this region, it is suggested to establish customer communication.

ii) Planning:

All Planning activities are carried out in orde to define resource time line and other project related activities

(iii) Risk Analysis :

The task required to calculate technical and management risks are carried out.

(iv) Engineering :

The task required to build one or more representations of applications are carried out.

v) Construct and release :

All the necessary tasks required to construct, test, install the application are conducted.

vi) Customer evaluation :

Customers feedback is obtained and based on customer evaluation required tasks are performed and implemented at installation stage.

→ In each region, number of work tasks are carried out depending upon the characteristics of project.

In spiral model, the s/w engineering team moves around the spiral in a clockwise direction beginning at the core.

Advantages:

→ Requirements changes can be made at every stage

→ Risks can be identified and rectified before they get problematic.

Disadvantages:

It is based on customer communication, If the communication is not proper then the s/w product that gets developed will not be up to the mark.

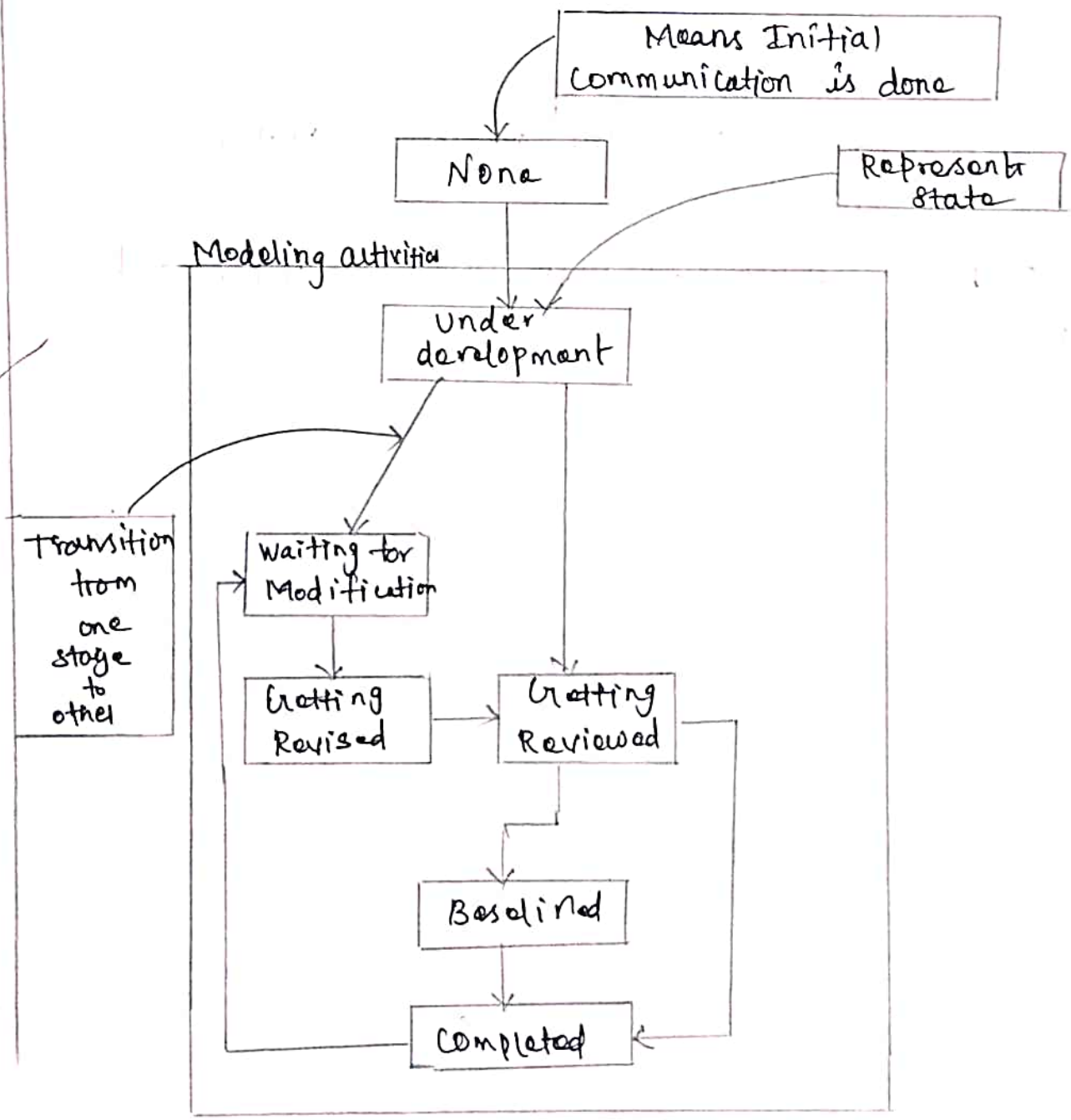
It demands considerable risk assessment.

Concurrent Development Model:

It is also called as concurrent engineering.

In this model, the framework activities or s/w development tasks are represented as states.

The modeling or designing phase of s/w development can be in one of the states like under development, waiting for modification, under revision or under review and so on.



All the s/w development activities exist concurrently in this model but these activities can be in various states.

These states make transitions.

That is during modeling, the transition from under development state to waiting for modification state occurs.

This model basically defines the series of events due to which the transition from one state to another state occurs.

Advantages:

1. This model provides accurate picture of current state of project.

2. Each activity or task can be carried out concurrently.

Specialized Model

The specialized models are used when only collection of specialized technique or methods are expected for developing the specific s/w.

Various types of specialized models are:

1. Component based development
2. Formal methods model
3. Aspect oriented s/w Development

Component Based Development:

The commerical off-the-shelves components that are developed by the vendors are used during the s/w built.

These components have specialized targeted functionalities and well defined interfaces.

Hence it is easy to integrate these components into the existing s/w.

The component based development model makes use of various characteristics of spiral model.

Following steps are applied for component based development.

1. Identify the component based products and analyze them for fitting in the existing application domain.

1. Analyze the component integration issues

2. Design the s/w Architecture to accommodate the components

4. Integrate the components into the s/w architecture.

5. conduct comprehensive testing for the developed software

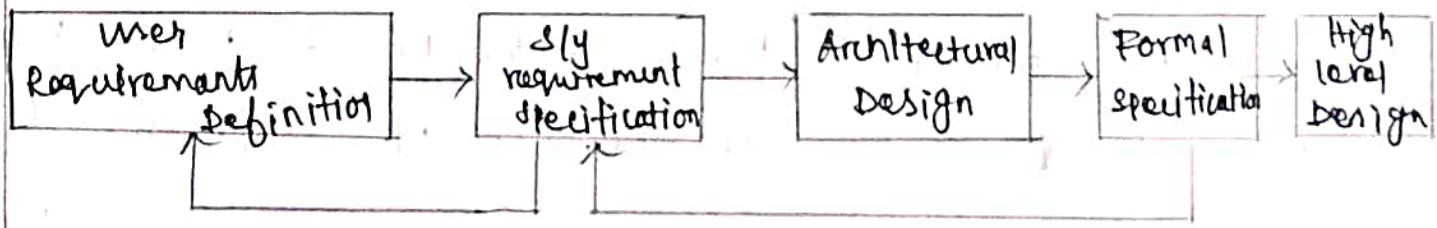
s/w reliability is the major advantage.

Formal Methods Model :

This model consists of the set of activities in which the formal mathematical specification is used.

cleanroom s/w engineering makes use of the formal method approach.

The advantage of using formal methods model is that it overcomes many problems that we encounter in traditional s/w process models.



This methods offers defect-free software

The drawbacks are :

1. Time consuming & expensive
2. Developers need strong mathematical background
3. Communication is very difficult.

Aspect oriented s/w development :

In traditional s/w development process, the system is decomposed into multiple units of primary functionality.

programmers need to keep in mind all the things that need to be done, how to deal with each issue, the problem associated with them and the correct execution.

This model focuses on the identification, specification and representation of cross-cutting concerns and their modularization into separate functional units.

It is a relatively new s/w engineering pb/m and is not matured enough.

Introduction to Agility

The Agile Manifesto, also called the Manifesto for Agile s/w development, is a formal declaration declaration of four key values and 12 principles to guide an iterative and people-centric approach to s/w development.

The agile methods were developed to overcome the weakness of conventional s/w engineering.

The agile manifesto is represented by

Individuals and Interactions	over	Process and tools
Working Software	over	Comprehensive Documentation
Customer Collaboration	over	Contact negotiation
Responding to change	over	Following a plan

Agile Process

In 1980's the heavy weight plan based s/w development approach was used to develop any s/w product.

In this approach too many things are done which were not directly related to s/w product being produced.

The agile processes are the light-weigh methods are people-based rather than plan-based methods.

It forces the development team to focus on s/w itself rather than design and documentation

It is an iterative method.

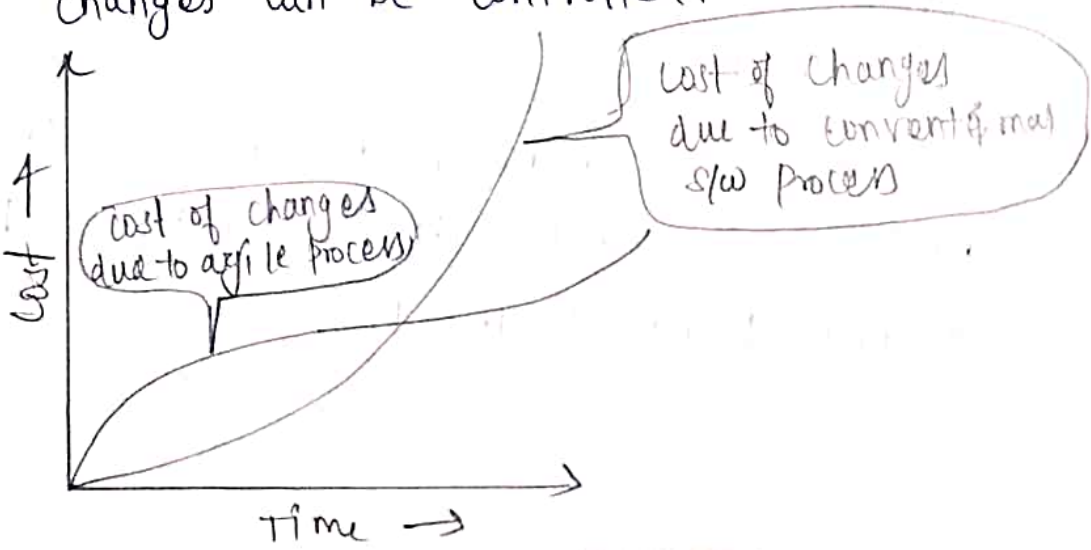
the aim of agile process is to deliver the working model of s/w quickly to the customer.

EX: Extreme programming

Agile Methodology:

the agile method proponents claim that if the s/w development is carried out using the agile approach then it will allow the s/w team to accomodate changes late in a s/w project without dramatic cost & time impact

In other words, if the incremental delivery is combined with agile practices such as continuous unit testing and pair programming then the cost of changes can be controlled.



Pros:

1. Efficient Delivery
2. Flexibility
3. Continuous Improvement
4. Transparency
5. Reduced Risk

Cons:

1. Need for disciplined Team
2. More Collaboration & communication
3. Lack of Documentation

Agile Principles:

There are famous 12 principles used as agility principles.

1. satisfy the customer by early and continuous delivery of valuable software

2. The changes in the requirements must be accommodated.

3- Deliver working slw quite often. within shorter time span delivery

4. Busines people and developers must work together throughout the project.

5. Motivate the People who are building the Projects.

6. the working s/w is the primary measure of the progress of the s/w development.

7. The Agile s/w development approach promote the constant project development.

8. To enhance the agility there should be continuous technical excellence.

9. The proper attention to be given to technical excellence and good design.

10. The simplicity must be maintained while developing the project using this approach.

11. The team must be the self-organizing team for getting best architecture, req & design

12. At regular intervals the teams thinks over the issue of becoming effective.

Extreme Programming

It is the one of the best known agile process.

It is suggested by Kent Beck in 2000.

XP values :

Beck defines the set of five values that serves as a basis for the work performed in XP.

These values are:

1. Communication :

The effective communication must be established between software developers and stakeholders in order to convey the important concepts and to get the important feedback.

2. Simplicity :

The s/w design should be simple.

3. Feedback :

The feedback for the s/w product can be obtained from the developers of the s/w, customers and other software team members.

4. Courage :

The strict adherence to certain XP practices require courage

5. Respect :

XP values the agile team can win the respect of stakeholders.

process :

The customer specifies and priorities the system requirements.

customer becomes one of the important members of the development team.

The developer and customer together prepare a story-card in which customer needs are mentioned.

A developer team then aims to implement the scenario in the story-card.

After developing the story-card the development team breaks down the total work in small tasks.

The customer prioritises the stories for implementation.

For accomodating new changes, new story-card must be developed.

Evaluate, the sly along with the customer.

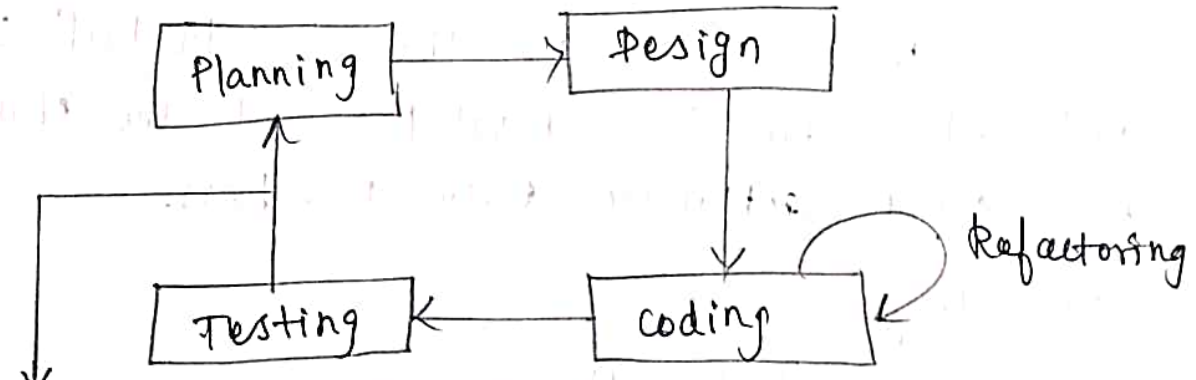


fig : XP process

Various rules and practices:

Planning:

1. User story cards
2. Release planning
3. small releases
4. Iterative process
5. stand up meeting

Designing:

1. simple Design
2. spike solution
3. Refactoring

Coding:

1. Customer Availability
2. paired programming
3. collective code ownership

Testing:

1. Unit Testing
2. continuous Integration
3. No Overtime

Industrial XP:

It can be defined as the organic evolution of XP.

It is a customer centric

It has expanded role for customers and advanced technical practices.

various new pratices that are appended to XP to create IXP are as follows:

1. Readiness Assessment
2. Project community
3. project Chartering
4. Test Driven Management
5. Retrospectives
6. continuous Learning

CCS356 - Object Oriented S/W Engineering

Unit - II

Requirements Analysis and Specification

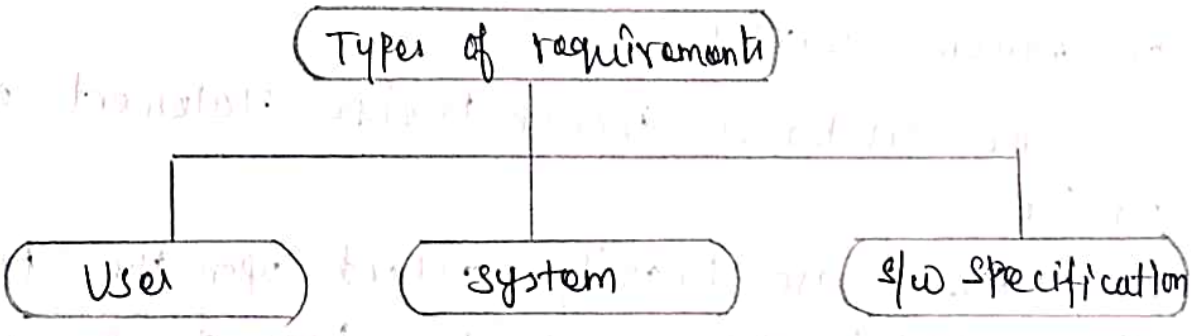
Requirement Analysis and Specification

A requirement can range from a high-level abstract statement of a service or of a sly constraint to a detailed mathematical functional specification.

The requirement must be open to interpretation and it must be defined in detail.

Types of requirement:

The requirement can be classified as



User Requirements:

It is a collection of statements in natural language plus description of the services the system provides and its operational constraints.

It is written for customers.

System Requirements:

It is a structured document that gives the detailed description of the system services.

It is written as a contract between client and customer.

Software specification:

It is a detailed s/w description than can serve as a basis for design or implementation.

Typically it is written for software developers.

Functional and Non-Functional Requirements:

Software system requirements can be classified as fun and non-functional requirements.

Functional Requirements:

It should describe all the required functionality or system services.

The customer should provide statement of service.

These are heavily depend upon the type of s/w, expected users and the type of s/y where the s/w is used.

Ex: consider a library s/y in which there is a single interface provided to multiple databases.

These DB are collection of articles from different libraries.

DisAdvantages:

1. Requirements imprecision
2. User Intention
3. Developer Interpretation
4. Requirements completeness and consistency.

Non-Functional Requirements:

It defines the s/y properties and constraints

various properties of a s/y are:

1. Reliability
2. Response Time
3. storage

It is more critical than functional requirements. If the non-functional requirements do not meet then the complete s/y is of no use

Types:

1. Product Requirements
2. organizational Requirements
3. External Requirements
4. Domain Requirements

Metrics used for specifying Non-functional Req:

1. Reliability
2. Availability
3. security

4. Maintainability
5. Extensibility
6. Portability
7. Reusability
8. Resource utilization

Requirement Gathering and Analysis:

After performing feasibility study the requirements elicitation and analysis can be done.

Requirement elicitation means discovery of all possible requirements.

After identifying all possible requirements the analysis on these requirements can be done.

S/w engineers communicate the end-users or customers in order to find out certain information such as: application domain, expected services from the sly etc...

Stakeholders:

The stakeholders means the person(s) who will be affected by the system.

For ex: end-user, sly maintenance engineers or s/w engineers can be stakeholders.

Problems:

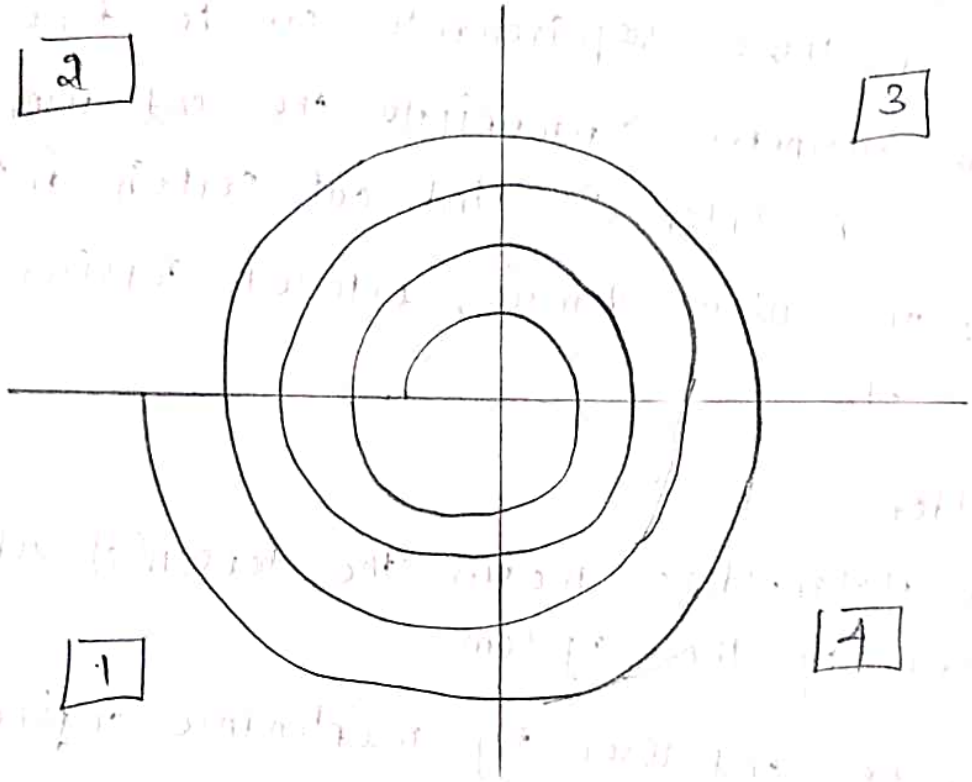
1. Unrealistic expectations
2. Differences in the req
3. Economic and busines environment
4. political changes.

Requirement Elicitation & Analysis Process:

The spiral model depicts the requirement elicitation and analysis Procers.

The process activities are:

1. Requirement Discovery
2. Requirament classification & Discovery
3. Requirement Prioritisation
4. Requirement Documentation



Software Requirement Specification :

It is the specification of the system.

It should include both a definition and a specification of requirements.

It is not a design document,

It should set of what the system should do rather than how it should do it.

SRS :

It provide a basis for creating the s/w Req specification

The SRS is useful in estimating cost, planning team activities, performing tasks and tracking the team's progress throughout the development activity.

Typically s/w Designers use IEEE STD 830-1998 as the basis for the entire s/w specifications.

The standard template for writing SRS is as given below.

Document Title

Author(s)

Affiliation

Address

Date

Document version

1. Introduction

1.1 purpose of this document:

Describes the purpose of the document

1.2 Scope of this document

Describes the scope of this requirements definition effort.

This section also details any constraints that were placed upon the requirements elicitation process, such as schedules, costs.

1.3 Overview:

Provides a brief overview of the product defined as a result of the req elicitation process.

2. General Description

Describes the general functionality of the product such as similar system information, user characteristics, user objective, general constraints placed on design team.

3. Functional Requirements:

This section lists the functional requirements in ranked order.

Each functional requirement should be specified in following manner.

- short, imperative sentence using highest ranked fun req.

1. Description
2. Criticality
3. Technical issues
4. Cost and schedule
5. Risks
6. Dependancies with other requirement
7. ...any other appropriate

4. Interface Requirements :

This section describes how the s/w interfaces with other s/w products or users for i/p (or) o/p.

4.1 User Interfaces

Describes how this product interfaces with the users.

4.1.1 GUI - Graphical User Interface

4.1.2 CLI - Command-line Interface.

4.1.3 API - Application Programming Interface.

4.2 Hardware Interfaces

Describes Interfaces to h/w devices.

4.3 Communication Interfaces

Describes n/w Interfaces

4.4 software Interfaces

Describes any remaining s/w Interfaces not included above.

5. Performance requirements :

specifies speed and memory requirements.

6. Design Constraints :

specifies any constraints for the design team such as s/w or h/w limitations.

7. other non-functional attributes

specifies any other particular non functional attributes required by the s/y. such as

7.1 security
7.2 Binary compatibility
7.3 Reliability
7.4 Maintainability
7.5 Portability
7.6 Extensibility
7.7 Reusability
7.8 Application compatibility
7.9 Resource utilization
7.10 Serviceability

8. Operational scenarios

This section should describe a set of scenarios that illustrate, from the user's perspective, what will be experienced when utilizing the s/y under various situation

9. preliminary schedule

This section provides an initial version of the project plan, including the major tasks to be accomplished, their interdependencies, and their tentative start / stop dates.

10. Preliminary Budget:

It provides an initial budget for the Project.

11. Appendices

11.1 Definitions, Acronyms, Abbreviations

Provides definitions terms and acronyms can be provided.

11.2 References

Provides complete citations for all documents and meetings referenced

Charaltaristics of SRS

1. correct
2. Unambiguous
3. Complete
4. consistent
5. Specific
6. Traceable

Formal system specification

It is a system specification for s/w requirements is an unambiguous s/w system description.

Here formal methods are used to represent the requirements of the system.

It provide us with tools to precisely describe a s/y and show that a s/y is correctly implemented.

Concept of Formal Technique

It is a mathematical method used to specify a h/w or s/w system.

It verify that the implementation satisfies the req specification.

The formal specification language consists of the syntatic domain, semantic domain and a relationship called satisfaction relation.

It can be used every stage of the SDCL(Req, spe, design, code & implementation).

Semantic Domain

Abstract Data type (ADT) specification languages are used to specify algebras and programs.

The programming Languages are used to specify function from i/p to o/p values.

The distributed s/y specification languages are used to specify state sequences, event seq, etc.

Syntactic domain:

The syntactic domain of formal specification consists of alphabets, symbols and set of rules.

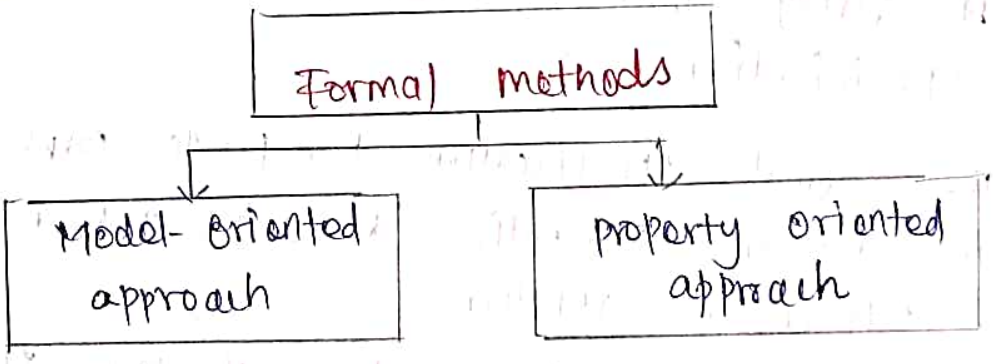
satisfaction relation:

The satisfaction is determined by a function which is known as semantic abstraction function.

The semantic abstraction function maps the element of semantic domain to equivalent classes.

TYPES:

The formal method is classified using two approaches.



Model oriented Approach:

The sys behaviour is represented by directly constructing a model of the sys with the help of mathematical structures such as tuples, relations, functions, sets and sequences.

Property oriented approach:

The sys behaviour is defined indirectly by stating its properties.

These properties are specified in terms of a set of axioms.

This method is more suitable for requirement specification

where as, model-oriented approach is more suitable for sly design specification.

The property oriented approach is classified into two categories,

1. Axiomatic specification
2. Algebraic specification

Axiomatic specification.

It is based on formal logic or predicate calculus.

The main purpose of this method is - formal program verification.

Axioms or interence rules are defined for each statement type in the language to allow transformation of logic expression into more formal logic expressions.

An axiom is a logical stmt that is assumed to be true.

An interence rule is a method of interring the truth of one assertion based on the values of other assertions

$$\frac{s_1, s_2, s_3 \ldots, s_n}{s}$$

The rule states that if $s_1, s_2 \ldots . s_n$ are true then the truth of s can be inferred.

Algebraic specification:

In this technique the object class or type is specified in terms of relationships that exist between the operations defined on that type

It defines a system as heterogeneous algebra.

It consist of four sections:

1. Type section
2. Exception section
3. syntax section
4. Equations section

Four set of operators:

1. Basic construction operators:
   - ↳ create & append
2. Extra construction operators:
   - ↳ Remove
3. Basic inspection operators
   - ↳ eval
4. Extra inspection operators

Finite state Machines :

It is a mathematical abstraction used to design algorithms.

In simpler terms, a state machine will read a series of inputs.

When it reads an input, it will switch to a different state

Each state specifies which state to switch to for a given i/p.

The finite state system is a very good design tool for programs such as text editors and lexical analyzer.

The lexical analyzer is a program that scans your program character by character and recognizes those words as tokens.

Formal Definition :

A FSM is a collection of 5-tuple $(Q, \Sigma, \delta, q_0, F)$ where,

Q - is a finite set of states, which is non empty

Σ - is input alphabet, indicates input set

q_0 - is an initial set

F - is a set of final states

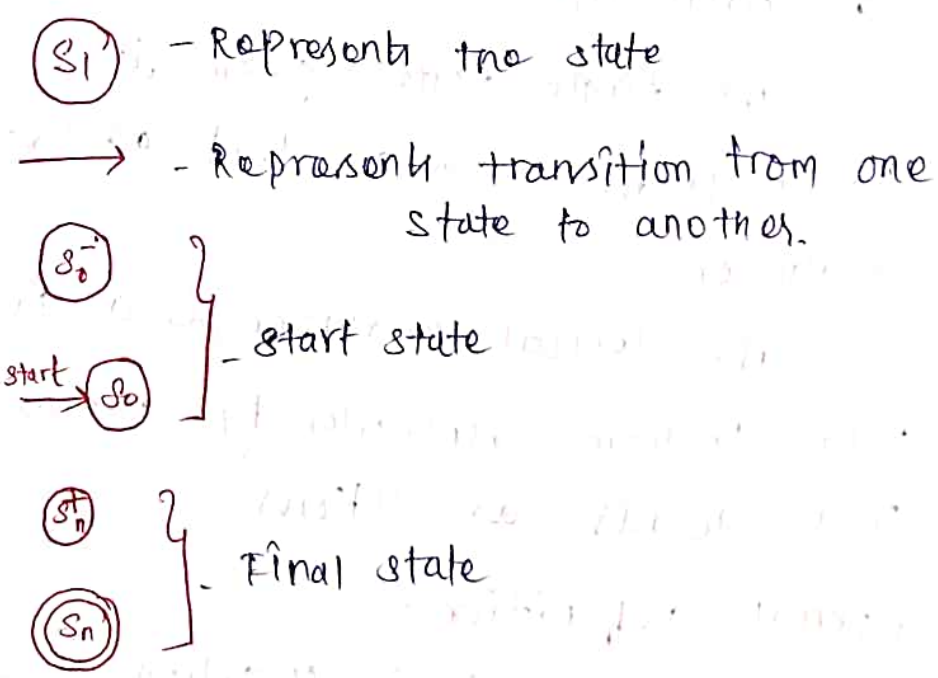
δ - is a transition function

Representation :

A transition diagram or transition graph can be defined as collection of -

1) Finite set of states K.
2) Finite set of symbols Σ.
3) A non empty set S of K. It is called start state
4) A set $F \subseteq K$ of final states
5) A transition fn $K \times A \rightarrow K$

The notations used in transition diagram are :



Types of Finite state Machines :

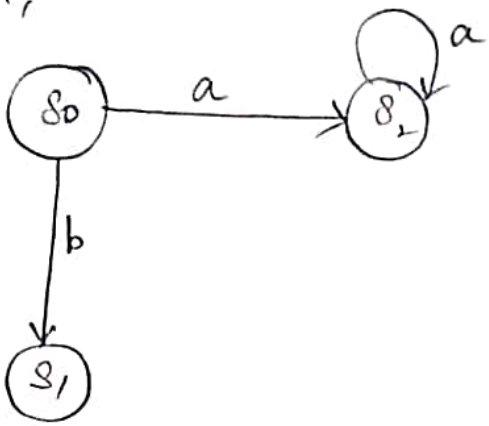
There are two types of finite state machine

i) Deterministic finite automata
ii) Non deterministic finite automata

Deterministic Finite state Machine :

It is called DFA if there is only one path for a specific input from current state to next state.

for Ex,



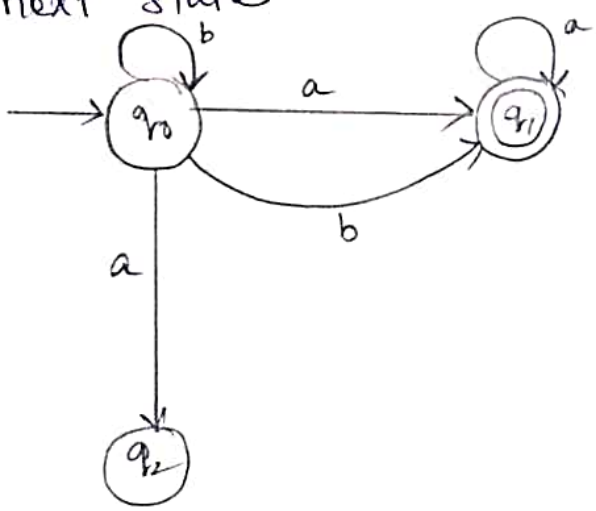
From state S_0 for input 'a' there is only one path going to S_2.

similarly from S_0 there is only one path for input b going to S_1

Non-Deterministic Finite state Automata (NFA)

This process is exactly reverse of deterministic finite automata.

The finite automata is called NFA when there exists many paths for specific i/p from current state to next state



NFA shows from q_0 for input 'a' there are two next states q_1 and q_2

Similarly, from q_0 for input 'b' the next states are q_0 and q_1.

Petri Nets:

It is invented by carl Adam petri in 1962.

It can be rigorously used to define the system.

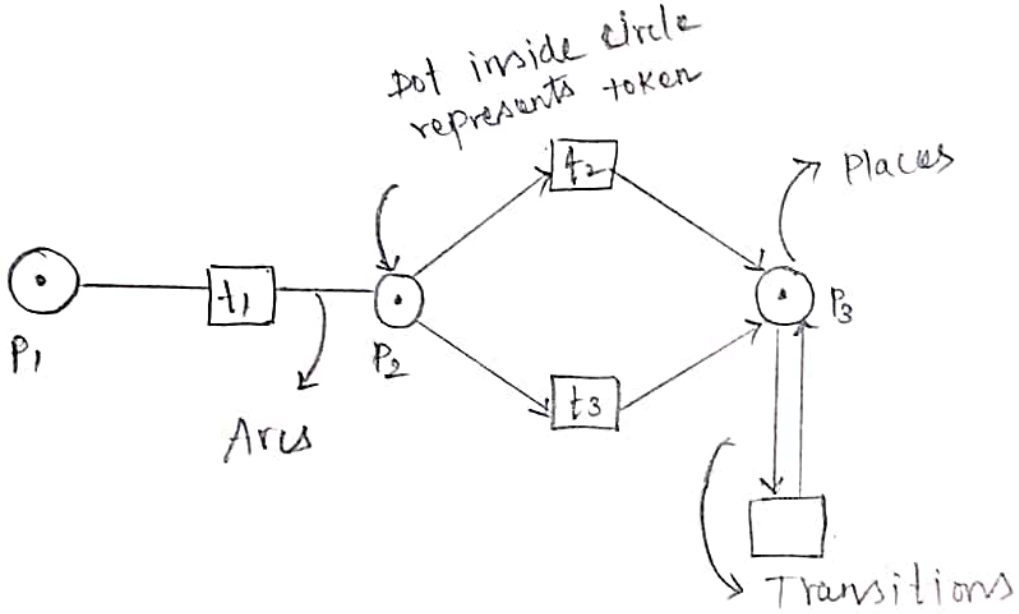
The petri nets are more popularly used for distributed systems and systems with resource sharing.

In petri Nets there are three types of components.

i) Places (circles)

ii) Transitions (Rectangles)

iii) Arcs (arrows)



Places: Represent Possible state of the s/y

Transitions: cause the change in the states

Arc: connects a place with transition or transition with a place.

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Department of Computer Science and Engineering

Academic Year:2023-2024

CCS356-Object Oriented Software Engineering

Year/Sem: III/6th

Two Marks Question and Answers

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UNIT I-SOFTWARE PROCESS AND AGILE DEVELOPMENT

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process-Case Study.

1. What is Software Engineering?

Software Engineering is the application of a systematic, disciplined, and quantifiable approach to the development, operation, and maintenance of software.

2. Define Software Process.

A software process is a structured set of activities involved in developing a software system, including requirements gathering, design, implementation, testing, and maintenance.

3. What are Perspective Process Models?

Perspective process models are traditional software development models, such as the Waterfall Model, Incremental Model, and Spiral Model, which provide a structured approach to software development.

4. Name two Specialized Process Models.

1. Component-Based Development (CBD)
2. Formal Methods Model

5. What is Agility in Software Development?

Agility refers to the ability to adapt quickly to changes in requirements and environments during the software development process.

6. What is Agile Development?

Agile Development is a methodology that emphasizes iterative development, customer collaboration, and flexibility to adapt to changing requirements.

7. List any two Agile principles.

1. Customer satisfaction through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development.

8. What is Extreme Programming (XP)?

Extreme Programming (XP) is an agile software development methodology focused on improving software quality and responsiveness to customer requirements through frequent releases and collaboration.

9. Name any two practices of Extreme Programming (XP).

1. Pair Programming
2. Test-Driven Development

10. Define XP Process.

The XP Process is a set of practices in Extreme Programming that includes planning, designing, coding, and testing in short, iterative cycles to ensure high-quality software.

11. What is meant by Iterative Development?

Iterative Development is a process of breaking down the software development into smaller cycles, with each cycle resulting in a deliverable increment of the product.

12. Mention two benefits of Agile Development.

1. Faster delivery of functional software.
2. Better alignment with customer needs due to continuous feedback.

13. What is the significance of a Case Study in Agile Development?

A case study in Agile Development demonstrates the practical application of Agile practices and their impact on project success through real-world examples.

14. What is a User Story in Agile Development?

A User Story is a simple description of a software feature from the end-user's perspective, focusing on what the user wants to achieve.

15. Differentiate between Agile and Waterfall models.

- **Agile:** Iterative, flexible, and promotes customer collaboration.
- **Waterfall:** Linear, rigid, and focuses on completing one phase before moving to the next.

16. What is the Waterfall Model?

The Waterfall Model is a linear and sequential software development process where each phase, such as requirements, design, implementation, and testing, must be completed before moving to the next. It is best suited for projects with well-defined requirements.

17. What is the Incremental Process Model?

The Incremental Process Model develops software in smaller increments or modules. Each increment delivers part of the required functionality, allowing early partial deployment and feedback from users.

18. Explain the Spiral Model.

The Spiral Model combines iterative development with risk management. It involves repeated cycles (spirals) of planning, risk analysis, engineering, and evaluation, making it ideal for large and complex projects.

19. What is the V-Model (Verification and Validation)?

The V-Model is an extension of the Waterfall Model emphasizing verification and validation. Each development phase has a corresponding testing phase, ensuring quality at every stage of development.

20. What is Component-Based Development (CBD)?

Component-Based Development focuses on reusing pre-existing software components. It reduces development time and cost by assembling components to build a new application.

UNIT II -REQUIREMENTS ANALYSIS AND SPECIFICATION

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram-CASE TOOLS.

1. What is Requirements Analysis?

Requirements Analysis is the process of gathering, analyzing, and refining user needs to ensure a clear understanding of the requirements. It helps identify what the system should do and lays the foundation for design and development.

2. Define Software Requirements Specification (SRS).

A Software Requirements Specification (SRS) is a document that clearly defines the functional and non-functional requirements of a software system. It serves as a contract between stakeholders and developers, ensuring all parties have a shared understanding.

3. What are Formal System Specifications?

Formal System Specifications use mathematical models to describe system requirements and behavior. They ensure precision and eliminate ambiguities, making them ideal for critical systems like aerospace and healthcare.

4. Explain Finite State Machines (FSM).

A Finite State Machine is a computational model that represents a system with a finite number of states, transitions, and actions. It is widely used in software design for modeling dynamic system behavior.

5. What are Petri Nets?

Petri Nets are graphical and mathematical modeling tools used to describe distributed systems. They consist of places, transitions, and tokens, enabling analysis of concurrent and asynchronous system behavior.

6. What is Object Modeling in UML?

Object Modeling in UML involves representing a system's objects, their attributes, operations, and relationships. It helps visualize the structure and interactions within the software system.

7. Define a Use Case Model.

A Use Case Model represents the functional requirements of a system by describing how users (actors) interact with it to achieve specific goals. It captures scenarios and defines the system's scope.

8. What is a Class Diagram?

A Class Diagram is a UML diagram that shows the static structure of a system. It represents classes, attributes, methods, and relationships like inheritance, association, and aggregation.

9. Explain Interaction Diagrams in UML.

Interaction Diagrams depict the dynamic behavior of a system, focusing on how objects collaborate to achieve a function. Common types include Sequence Diagrams and Communication Diagrams.

10. What is an Activity Diagram?

An Activity Diagram represents workflows or processes within a system. It shows the sequence of activities, decisions, and parallel flows, making it useful for modeling business processes and use cases.

11. What is a State Chart Diagram?

A State Chart Diagram illustrates the states of an object and the transitions triggered by events. It helps in modeling the life cycle and behavior of an object in a system.

12. What is Functional Modeling?

Functional Modeling describes the system's functions and their interactions. It focuses on what the system does and includes tools like Data Flow Diagrams (DFDs) to represent processes and data flow.

13. Define Data Flow Diagram (DFD).

A Data Flow Diagram is a graphical representation of data movement within a system. It includes processes, data stores, data flows, and external entities to illustrate system functionality.

14. What are CASE Tools?

CASE (Computer-Aided Software Engineering) Tools are software tools that automate various software development activities. Examples include diagram generation, code generation, and documentation management.

15. What is the purpose of Requirements Gathering?

Requirements Gathering involves collecting user needs and expectations through interviews, surveys, and workshops. It ensures that the development team understands what the stakeholders want.

16. What are Non-Functional Requirements?

Non-Functional Requirements define the system's quality attributes, such as performance, scalability, security, and usability. They are essential for ensuring the system meets user expectations beyond functionality.

17. What is the role of UML in Software Development?

Unified Modeling Language (UML) provides standard visual diagrams to model software systems. It helps developers, analysts, and stakeholders understand and communicate system design and behavior.

18. Define a Sequence Diagram in UML.

A Sequence Diagram shows how objects interact in a specific sequence to perform a function. It includes lifelines, messages, and activations, making it useful for modeling use case scenarios.

19. What is a Communication Diagram?

A Communication Diagram, also known as a Collaboration Diagram, represents object interactions in a system. It emphasizes the relationships and message flow between objects.

20. How does an Activity Diagram differ from a Sequence Diagram?

An Activity Diagram focuses on workflows and processes, representing activities and decisions. In contrast, a Sequence Diagram focuses on the chronological order of interactions between objects in a scenario.

21.Comapre Functional Requirements and Non-Functional Requirements

Aspect	Functional Requirements	Non-Functional Requirements
Definition	Describes what the system should do, focusing on functionality.	Describes the system's quality attributes and operational behavior.
Examples	Login functionality, payment processing, report generation.	Performance, security, scalability, and usability.
Testing	Verified through functional testing.	Verified through performance, stress, or usability testing.
Importance	Defines the core operations of the system.	Enhances user experience and system effectiveness.

UNIT III SOFTWARE DESIGN

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered - Client Server - Tiered - Pipe and filter- User interface design-Case Study.

1. What is Software Design?

Software Design is the process of defining the architecture, components, interfaces, and data for a software system to satisfy specified requirements. It bridges the gap between requirements and implementation.

2. What are the steps in the Design Process?

The design process involves steps such as analyzing requirements, defining system architecture, creating component-level designs, and refining the design iteratively.

3. Define Coupling in Software Design.

Coupling refers to the degree of dependency between software modules. Lower coupling is desirable as it promotes modularity and makes the system easier to maintain and extend

4. Define Cohesion in Software Design.

Cohesion measures how closely related and focused the responsibilities of a single module are. High cohesion is desirable as it ensures that a module has a single, well-defined purpose.

5. What is Functional Independence?

Functional Independence means designing modules that perform a single task with minimal interaction with other modules. It enhances maintainability and reusability.

6. What are Design Patterns?

Design Patterns are reusable solutions to common problems in software design. They provide templates to solve design challenges in a systematic and efficient manner.

7. Explain the Model-View-Controller (MVC) design pattern.

MVC separates an application into three components:

- **Model:** Manages data and logic.
- **View:** Handles the user interface.
- **Controller:** Manages communication between the model and view.

8. What is the Publish-Subscribe Pattern?

In the Publish-Subscribe pattern, publishers send messages without knowing the subscribers, and subscribers receive messages of interest without knowing the publishers. It is useful for decoupling components.

9. Define the Adapter Pattern.

The Adapter Pattern converts the interface of one class into another interface clients expect. It allows incompatible interfaces to work together seamlessly.

10. What is the Command Pattern?

The Command Pattern encapsulates a request as an object, allowing you to parameterize clients with different requests, delay or queue execution, and support undoable operations.

11. Explain the Strategy Pattern.

The Strategy Pattern defines a family of algorithms, encapsulates each one, and makes them interchangeable. It allows the behavior of a class to be selected at runtime.

12. What is the Observer Pattern?

The Observer Pattern allows one object (subject) to notify a list of dependent objects (observers) when its state changes. It is commonly used in event-driven systems

13. Define the Proxy Pattern.

The Proxy Pattern provides a surrogate or placeholder for another object to control access to it. It is useful for lazy initialization, logging, or security

14. What is the Facade Pattern?

The Facade Pattern provides a simplified interface to a larger body of code, making it easier for clients to interact with a complex subsystem

15. What are Architectural Styles?

Architectural styles are design templates that describe the overall structure of a system, such as how components interact and are organized. Examples include layered, client-server, and pipe-and-filter.

16. What is the Layered Architecture Style?

The Layered Architecture organizes a system into layers where each layer performs specific tasks. Higher layers depend on lower layers but not vice versa, promoting modularity

17. Define the Client-Server Architecture.

The Client-Server Architecture divides a system into two components:

- **Client:** Requests services.
- **Server:** Provides services.
  It is commonly used in networked applications.

18. What is Tiered Architecture?

Tiered Architecture, or N-Tier Architecture, separates a system into logical layers (e.g., presentation, business logic, and data). It is scalable and supports distributed systems.

19. Explain the Pipe-and-Filter Architecture Style.

The Pipe-and-Filter Architecture organizes a system as a sequence of processing elements (filters) connected by data streams (pipes). It is useful for data processing systems.

20. What is User Interface Design?

User Interface Design focuses on creating interfaces that are easy to use, visually appealing, and functional. It considers usability principles, such as clarity, consistency, and user feedback.

UNIT IV -SOFTWARE TESTING AND MAINTENANCE

Testing – Unit testing – Black box testing– White box testing – Integration and System testing–Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking-Case Study

1. What is Software Testing?

Software Testing is the process of evaluating a software system to check if it meets the required specifications and is free of defects. It helps identify bugs, improve quality, and ensure functionality. Testing can be manual or automated.

2. Define Unit Testing.

Unit Testing focuses on verifying the functionality of individual components or modules in isolation. It ensures that each module works correctly before integrating it with others. It is often automated using tools like JUnit.

3. What is Black Box Testing?

Black Box Testing evaluates software functionality without considering its internal logic or structure. Testers provide inputs and compare outputs to expected results. It ensures the software meets functional requirements.

4. What is White Box Testing?

White Box Testing examines the internal code structure and logic of the software. It includes techniques like statement coverage, branch testing, and path testing. It ensures code correctness and efficiency.

5. What is Integration Testing?

Integration Testing verifies the interaction between integrated software modules. It ensures data flow between modules works as expected. Techniques include top-down, bottom-up, and sandwich testing.

6. Define System Testing.

System Testing tests the complete and integrated system against its specifications. It evaluates functional and non-functional requirements, ensuring the software meets user expectations in real-world scenarios.

7. What is Regression Testing?

Regression Testing ensures that changes or updates in the software do not introduce new defects in existing functionality. It involves re-executing test cases for previously tested components.

8. What is Debugging?

Debugging is the process of identifying, isolating, and fixing defects in the code. It often involves analyzing error logs, using breakpoints, and stepping through code. It ensures proper functionality after changes.

9. What is Program Analysis?

Program Analysis examines the source code to identify potential issues, such as bugs, inefficiencies, or security vulnerabilities. It can be static (without execution) or dynamic (during execution).

10. Define Symbolic Execution.

Symbolic Execution tests program paths using symbolic inputs instead of concrete data. It generates constraints for paths and helps detect errors like unhandled exceptions or unreachable code.

11. What is Model Checking?

Model Checking is a formal verification technique for finite-state systems. It systematically explores system states to verify if they satisfy specified properties, like safety and liveness.

12. What are Test Cases?

Test Cases are a set of conditions, inputs, and expected outputs designed to verify specific functionality. They help ensure that the software behaves as intended and detect issues systematically.

13. What is Static Testing?

Static Testing involves reviewing the software's code, documents, or requirements without executing the program. It identifies errors early through techniques like code reviews, walkthroughs, and inspections.

14. Define Dynamic Testing.

Dynamic Testing evaluates the software's runtime behavior by executing it with specific inputs. It checks both functional and non-functional requirements, ensuring the software performs as expected.

15. What is Boundary Value Analysis (BVA)?

Boundary Value Analysis focuses on testing the extreme edges of input ranges. For instance, if the valid range is 1 to 10, BVA tests 0, 1, 10, and 11 to uncover edge-case defects.

16. What is Equivalence Partitioning?

Equivalence Partitioning divides inputs into partitions or classes where all values in a class are expected to produce similar results. Testing one value from each partition reduces redundancy while covering possible scenarios.

17. What is the importance of Maintenance in Software Engineering?

Software Maintenance involves modifying software after deployment to correct defects, improve performance, or adapt to changes. It ensures the software remains functional and relevant over time.

UNIT V -PROJECT MANAGEMENT

Software Project Management- Software Configuration Management - Project Scheduling- DevOps: Motivation-Cloud as a platform-Operations- Deployment Pipeline: Overall Architecture Building and Testing-Deployment- Tools- Case Study

1. What is Software Project Management?

Software Project Management involves planning, executing, monitoring, and closing software projects. It ensures projects are completed on time, within scope, and budget while meeting quality standards. It includes tasks like resource allocation, risk management, and progress tracking.

2. What is Software Configuration Management (SCM)?

Software Configuration Management (SCM) is a process that tracks and controls changes in software, ensuring that the right version of code and documentation is used throughout development. It includes version control, change management, and configuration auditing.

3. What is the purpose of Project Scheduling in Software Management?

Project Scheduling involves creating a timeline for project tasks, allocating resources, and tracking progress. It ensures that project milestones and deadlines are met efficiently, reducing delays and improving workflow management.

4. What is DevOps?

DevOps is a set of practices that combines software development (Dev) and IT operations (Ops). It aims to shorten development cycles, increase deployment frequency, and provide continuous delivery through automation and collaboration between development and operations teams.

5. What motivates the adoption of DevOps?

The motivation behind adopting DevOps is to improve collaboration between development and operations teams, increase deployment speed, reduce failures, and improve recovery times, ensuring that software is delivered more frequently and with higher quality.

6. What role does Cloud play as a platform in DevOps?

Cloud platforms enable DevOps by providing scalable infrastructure, flexible computing resources, and automation tools. They support continuous integration and continuous delivery (CI/CD) pipelines, making it easier to deploy and manage software across environments.

7. What are the Operations in DevOps?

Operations in DevOps focus on maintaining the infrastructure and environment in which the software is deployed. This includes monitoring system health, scaling resources, handling incidents, and ensuring the software operates smoothly in production.

8. What is a Deployment Pipeline in DevOps?

A Deployment Pipeline is an automated process that moves code from development to production through several stages like build, test, and deployment. It ensures that only tested and validated code is deployed to production, reducing the risk of defects.

9. Describe the overall architecture of a Deployment Pipeline.

The overall architecture of a Deployment Pipeline typically includes stages like:

1. **Source:** Code is pushed to the repository.
2. **Build:** Code is compiled and packaged.
3. **Test:** Automated tests run to validate functionality.
4. **Deploy:** Software is deployed to a staging or production environment.

10. What is the role of Building in the Deployment Pipeline?

Building in the Deployment Pipeline refers to compiling the source code, integrating components, and generating deployable artifacts. This ensures that the application is ready for testing and deployment in the subsequent stages of the pipeline.

11. What is the role of Testing in the Deployment Pipeline?

Testing in the Deployment Pipeline automates the execution of unit tests, integration tests, and performance tests. It ensures that the software behaves as expected and meets quality standards before it is deployed to production.

12. What is the Deployment stage in the Deployment Pipeline?

The Deployment stage involves deploying the software to a target environment, such as production or staging. This step ensures that the application is available for end-users and can be rolled back if necessary.

13. What are the Tools used in DevOps for Project Management?

Tools commonly used in DevOps for project management include Jira for task management, Jenkins for continuous integration, Git for version control, Docker for containerization, and Kubernetes for orchestration of containers.

14. What is the significance of Software Configuration Management (SCM) in DevOps?

SCM in DevOps helps maintain consistency across development, testing, and production environments. It ensures that the correct version of the software is deployed and supports continuous integration and delivery pipelines.

15. Explain the concept of Cloud as a platform in DevOps.

Cloud platforms provide infrastructure and services that enable DevOps teams to deploy, monitor, and scale applications. They offer features like auto-scaling, load balancing, and managed services, which streamline development and operations tasks.

16. What is Continuous Integration in DevOps?

Continuous Integration (CI) is a DevOps practice where code changes are automatically integrated into the main codebase multiple times a day. This practice helps detect integration errors early and ensures that the code remains deployable.

17. What is Continuous Deployment in DevOps?

Continuous Deployment (CD) is an extension of Continuous Integration where code changes are automatically deployed to production once they pass testing. This allows for faster delivery of new features and bug fixes to end-users.

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IIT Kanpur

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