Ref No:

SKIT, BANGALORE

COURSE PLAN

Academic Year 2019-20

Program:	B E – Information Science & Engineering
Semester :	6
Course Code:	17ISL67
Course Title:	SOFTWARE TESTING LABORATORY
Credit / L-T-P:	2 /1-0-2
Total Contact Hours:	40
Course Plan Author:	Mrs. Veena M. Naik

Academic Evaluation and Monitoring Cell

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INSTRUCTIONS TO TEACHERS

- Classroom / Lab activity shall be started after taking attendance.
- Attendance shall only be signed in the classroom by students.
- Three hours attendance should be given to each Lab.
- Use only Blue or Black Pen to fill the attendance.
- Attendance shall be updated on-line & status discussed in DUGC.
- No attendance should be added to late comers.
- Modification of any attendance, over writings, etc is strictly prohibited.
- Updated register is to be brought to every academic review meeting as per the COE.

Table of Contents

Note : Remove “Table of Content” before including in CP Book
Each Laboratory Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. LABORATORY INFORMATION

1. Laboratory Overview

Degree:	B.E	*Program:*	IS
Year / Semester :	5	*Academic Year:*	2019-20
Course Title:	Software Testing Laboratory	*Course Code:*	17ISL67
Credit / L-T-P:	2 / 1-0-2	*SEE Duration:*	180 Minutes
Total Contact Hours:	40 Hrs	*SEE Marks:*	60 Marks
CIA Marks:	40	*Assignment*	
-Lab. Plan Author:	Veena M. Naik	*Sign*	Dt : 22/01/2020
Checked By:		*Sign*	Dt :

2. Laboratory Content

Expt.	Title of the Experiments	Lab	Concept	Blooms

		Hours		Level
1	Design and develop a program in a language of your choice to solve the triangle problem	3	boundary value	L5 evaluate
2	Design, develop, code and run the program in any suitable language to solve the commission problem	3	boundary value	L5 evaluate
3	Design, develop, code and run the program in any suitable language to implement the NextDate function	3	boundary value	L5 evaluate
4	Design and develop a program in a language of your choice to solve the triangle problem	3	Equivalence class	L5 evaluate
5	Design, develop, code and run the program in any suitable language to solve the commission problem	3	Equivalence class	L5 evaluate
6	Design, develop, code and run the program in any suitable language to implement the NextDate function	3	Equivalence class	L5 evaluate
7	Design and develop a program in a language of your choice to solve the Triangle problem	3	Decision table	L5 evaluate
8	Design, develop, code and run the program in any suitable language to solve the commission problem	3	Decision table	L5 evaluate
9	Design, develop, code and run the program in any suitable language to solve the commission problem	4	Decision table	L5 evaluate
10	Design, develop, code and run the program in any suitable language to implement the binary search algorithm	4	binary search algorithm	L5 evaluate
11	Design, develop, code and run the program in any suitable language to implement the quicksort algorithm	4	quick sort algorithm	L5 evaluate
12	Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions	4	absolute letter grading	L5 evaluate

3. Laboratory Material

Books & other material as recommended by university (A, B) and additional resources used by Laboratory teacher (C).

Expt.	Details	Expt. in book	Availability
1	Text books		
	Paul C. Jorgensen: Software Testing, A Craftsman's Approach,3rd Edition, Auerbach Publications,2008	1-12	In Lib
	Mauro Pezze, Michal Young :Software Testing and Analysis- Process, Principles and Techniques, Wiley India,2008	1-12	In Lib
2	Reference books		
3	Others (Web, Video, Simulation, Notes etc.)		Available
	https://www.guru99.com/software-testing-interview-questions.html		
D	**Software Tools for Design**	**-**	Available
	Excel worksheet		
	Automation testing tools		
E	**Recent Developments for Research**	**-**	**-**
1			
2			
		-	In lib
F	**Others (Web, Video, Simulation, Notes etc.)**	**-**	**-**
1	https://www.softwaretestingmaterial.com/boundary-value-analysis-		

	testing-technique/		
2	https://www.youtube.com/watch?v=zDMxb13ibqc		
3	https://www.guru99.com/decision-table-testing.html		
4	https://www.globalapptesting.com/blog/regression-testing-while-cooking-a-curry		
5	https://www.softwaretestingmaterial.com/software-testing/		
6	https://www.youtube.com/watch?v=w1h2xmEhWQE		
7	https://www.youtube.com/watch?v=21wOCNHsSU4		

4. Laboratory Prerequisites:

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

Expt.	Lab. Code	Lab. Name	Topic / Description	Sem	Remarks	Blooms Level
1	15IS63	Software Testing	Basic software testing	6	Learned as part of theory subject in the current semester	L3

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Expt.	Topic / Description	Area	Remarks	Blooms Level
1-12	Different types of software testing techniques	Placement	Seminar will be conducted to discuss these topics	Understand L2

B. Laboratory Instructions

1. General Instructions

SNo	Instructions	Remarks
1	Observation book and Lab record are compulsory.	Instructed to students
2	Students should report to the concerned lab as per the time table.	Instructed to students
3	After completion of the program, certification of the concerned staff in-charge in the observation book is necessary.	Instructed to students
4	Student should bring a notebook of 100 pages and should enter the readings /observations into the notebook while performing the experiment.	Instructed to students
5	The record of observations along with the detailed experimental procedure of the experiment in the Immediate last session should be submitted and certified staff member in-charge.	Instructed to students
6	Should attempt all problems / assignments given in the list session wise.	Instructed to students
7	It is responsibility to create a separate directory to store all the programs, so that nobody else can read or copy.	Instructed to students
8	When the experiment is completed, should disconnect the setup made by them, and should return all the components/instruments taken for the purpose.	Instructed to students
9	Any damage of the equipment or burn-out components will be viewed seriously either by putting penalty or by dismissing the total group of students from the lab for the semester/year	Instructed to students
10	Completed lab assignments should be submitted in the form of a Lab Record in which you have to write the algorithm, program code along with	Instructed to students

	comments and output for various inputs given	

2. Laboratory Specific Instructions

SNo	Specific Instructions	Remarks
1	Login to fedora	Guided
2	Create a folder in roots home	Guided
3	Open the terminal and enter into the folder	Guided
4	Type vi filename.c then enter	Guided
5	Write the program and save using the command shift +colon-> wq ->enter	Guided
6	Compile the program using cc filename.c	Guided
7	Run the program using ./a.out	Guided

C. OBE PARAMETERS

1. Laboratory Outcomes

Expt.	Lab Code #	COs / Experiment Outcome	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
-	-	**At the end of the experiment, the student should be able to . . .**	-	-	-	-	-
1	17ISL67.1	Design and evaluate test cases for boundary value	9	boundary value	Demonstrate	Viva and slip test	L5 evaluate
2	17ISL67.2	Design and evaluate test cases for equivalence class	10	Equivalence class	Demonstrate	Viva and slip test	L5 evaluate
3	17ISL67.3	Design and evaluate test cases for decision table	9	Decision table	Demonstrate	Viva and slip test	L5 evaluate
4	17ISL67.4	Design and evaluate test cases for binary search algorithm	4	binary search algorithm	Demonstrate	Viva and slip test	L Analyze
5	17ISL67.5	Design and evaluate test cases for quick sort algorithm	4	quick sort algorithm	Demonstrate	Viva and slip test	L5 evaluate
6	17ISL67.6	Design and evaluate test cases for absolute letter grading	4	absolute letter grading	Demonstrate	Viva and slip test	L5 evaluate
	-	**Total**	**40**	**-**	**-**	**-**	**-**

Note: Identify a max of 2 Concepts per unit. Write 1 CO per concept.

2. Laboratory Applications

Expt.	Application Area	CO	Level
1	To test the errors at boundaries of input domain	CO1	L5
2	System behavior testing	CO2	L5
3	Calculation of physical quantities	CO3	L5
4	Library, DNA sequences	CO4	L5
5	Image processing	CO5	L5
6	Developing web-based application using database for business requirements.	CO6	L3

Note: Write 1 or 2 applications per CO.

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.

To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Expt.	Mapping		Mapping Level	Justification for each CO-PO pair	Level
	CO	**PO**	**-**	**'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'**	**-**
1,2,3	CO1	PO1	L3	Knowledge of boundary value test cases is required to solve the different problem	L2
	CO1	PO2	L4	Analysing the types of problems requires the knowledge of boundary value testing	
	CO1	PO3	L5	Design test cases for different problem	
	CO1	PO4		No investigation and interpretation content. No mapping.	
	CO1	PO5	L3	Boundary value testing is done using different testing tools	
	CO1	PO6	L3	Boundary value testing is used in individual project management	
	CO1	PO7		No engineer and society content. No mapping.	
	CO1	PO8	L3	Error free product is produced to the different domains	
	CO1	PO9		No individual and team work. No mapping.	
	CO1	PO10		No usage for communication. No mapping.	
	CO1	PO11		No project management and finance. No mapping	
	CO1	PO12	L3	Boundary value Testing is a life long learning for real world application	
4,5,6	CO2	PO1	L3	Knowledge of equivalence class value test cases is required to solve the different problem	
	CO2	PO2	L4	Analysing the types of problems requires the knowledge of equivalence class testing	
	CO2	PO3	L5	Design test cases for different problem	
	CO2	PO4		No investigation and interpretation content. No mapping.	
	CO2	PO5	L3	Equivalence class testing is done using different testing tools	
	CO2	PO6	L3	Equivalence class testing is used in individual project management	
	CO2	PO7		No engineer and society content. No mapping.	
	CO2	PO8	L3	Error free product is produced to the different domains	
	CO2	PO9		No individual and team work. No mapping.	
	CO2	PO10		No usage for communication. No mapping.	
	CO2	PO11		No project management and finance. No mapping	
	CO2	PO12	L3	Equivalence class Testing is a life long learning for real world application	L4
7,8,9	CO3	PO1	L3	Knowledge of decision table is required to solve the different problem	L4
	CO3	PO2	L4	Analysing the types of problems requires the knowledge of decision table testing	L3
	CO3	PO3	L5	Design test cases for different problem	L5
	CO3	PO4		No investigation and interpretation content. No mapping.	L6
	CO3	PO5	L3	decision table testing is done using different testing tools	L6
	CO3	PO6	L3	decision table testing is used in individual project management	L6
	CO3	PO7		No engineer and society content. No mapping.	L2
	CO3	PO8	L3	Error free product is produced to the different domains	L4
	CO3	PO9		No individual and team work. No mapping.	L3
	CO3	PO10		No usage for communication. No mapping.	L3
	CO3	PO11		No project management and finance. No mapping	L5
	CO3	PO12	L3	decision table Testing is a life long learning for real world application	L6
10	CO4	PO1	L3	Knowledge of test cases is required to solve the binary search problem	L6
	CO4	PO2	L4	Analysing the binary search problem requires the knowledge of testing	L6
	CO4	PO3	L5	Design test cases for binary search problem requires the test cases	L2
	CO4	PO4		No investigation and interpretation content. No mapping.	L4
	CO4	PO5	L3	Testing is done using different testing tools	L4
	CO4	PO6	L3	Testing is used in individual project management	L3
	CO4	PO7		No engineer and society content. No mapping.	L6
	CO4	PO8	L3	Error free product is produced to the different domains	L6
	CO4	PO9		No individual and team work. No mapping.	L6
	CO4	PO10		No usage for communication. No mapping.	L6
	CO4	PO11		No project management and finance. No mapping	L2

	CO4	PO12	L3	Testing is a life long learning for real world application	L3
11	CO5	PO1	L3	Knowledge of test cases is required to solve the binary search problem	L3
	CO5	PO2	L4	Analyzing the quick sort problem requires the knowledge of testing	L5
	CO5	PO3	L5	Design test cases for quick sort problem requires the test cases	L6
	CO5	PO4		No investigation and interpretation content. No mapping.	L6
	CO5	PO5	L3	Testing is done using different testing tools	L6
	CO5	PO6	L3	Testing is used in individual project management	L2
	CO5	PO7		No engineer and society content. No mapping.	L4
	CO5	PO8	L3	Error free product is produced to the different domains	L3
	CO5	PO9		No individual and team work. No mapping.	L3
	CO5	PO10		No usage for communication. No mapping.	L6
	CO5	PO11		No project management and finance. No mapping	L6
	CO5	PO12	L3	Testing is a life long learning for real world application	L6
12	CO6	PO1	L3	Knowledge of test cases is required to solve the letter grading problem	L6
	CO6	PO2	L4	Analysing the letter grading problem requires the knowledge of testing	L2
	CO6	PO3	L5	Design test cases for binary search problem requires the test cases	L4
	CO6	PO4		No investigation and interpretation content. No mapping.	L3
	CO6	PO5	L3	Testing is done using different testing tools	L3
	CO6	PO6	L3	Testing is used in individual project management	L6
	CO6	PO7		No engineer and society content. No mapping.	L6
	CO6	PO8	L3	Error free product is produced to the different domains	L6
	CO6	PO9		No individual and team work. No mapping.	L6
	CO6	PO10		No usage for communication. No mapping.	
	CO6	PO11		No project management and finance. No mapping	
	CO6	PO12	L3	Testing is a life long learning for real world application	

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Experiment Outcomes	Program Outcomes														-
Expt.	CO.#	**At the end of the experiment student should be able to . . .**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	Level
1	17ISL67.1	Design and evaluate test cases for boundary value	**3**	**3**	**3**	**-**	**3**	**3**	-	-	-	-	-	**3**	**3**	**3**	**3**	L5
2	17ISL67.2	Design and evaluate test cases for equivalence class	**3**	**3**	**3**	-	**3**	**3**	-	-	-	-	-	3	3	3	3	L5
3	17ISL67.3	Design and evaluate test cases for decision table	**3**	**3**	**3**	-	**3**	**3**	-	-	**-**	**-**	-	**3**	**3**	**3**	**3**	L5
4	17ISL67.4	Design and evaluate test cases for binary search algorithm	**3**	**3**	**3**	**-**	**3**	**3**	-	-	-	-	-	**3**	**3**	**3**	**3**	L5
5	17ISL67.5	Design and evaluate test cases for quick sort algorithm	**3**	**3**	**3**	**-**	**3**	**3**	-	-	-	**-**	-	**3**	**3**	**3**	**3**	L5
6	17ISL67.6	Design and evaluate test cases for absolute letter grading	**3**	**3**	**3**	**-**	**3**	**3**	-	-	-	**-**	-	**3**	**3**	**3**	**3**	L6
-	**17ISL67**	**Average attainment (1, 2, or 3)**	**3**	**3**	**3**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	3	3	3	
-	*PO, PSO*	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design*															

5. Curricular Gap and Experiments

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Expt	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping

Note: Write Gap topics from A.4 and add others also.

6. Experiments Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Expt	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping

D. COURSE ASSESSMENT

1. Laboratory Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Unit	Title	Teaching Hours	No. of question in Exam							CO	Levels
			CIA-1	CIA-2	CIA-3	Asg-1	Asg-2	Asg-3	SEE		
1	Design and develop a test cases for triangle problem using boundary value analysis	3	1	-	-	-	-	-	1	CO1	L4
2	Design and develop a test cases for commission problem using boundary value analysis	3	1	-	-	-	-	-	1	CO1	L4
3	Design and develop a test cases for next date function using boundary value analysis	3	1	-	-	-	-	-	1	CO1	L4
4	Design and develop a test cases for triangle problem using equivalence class testing	3	1	-	-	-	-	-	1	CO2	L4
5	Design and develop a test cases for commission problem using equivalence class testing	3		1	-	-	-	-	1	CO2	L4
6	Design and develop a test cases for next date function using equivalence class testing	3		1	-	-	-	-	1	CO2	L3
7	Design and develop a test cases for triangle problem using decision table testing	3		1	-	-	-	-	1	CO3	L3
8	Design and develop a test cases for commission problem using decision table testing	3		1	-	-	-	-	1	CO3	L3
9	Design and develop a test cases for next date function using decision table testing	4		-	1	-	-	-	1	CO3	L3
10	Design, develop test cases for binary search algorithm	4		-	1	-	-	-	1	CO4	L3
11	Design, develop test cases for	4		-	1	-	-	-	1	CO5	L3

	quick sort algorithm										
12	Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions	4		-	1	-	-	-	1	CO6	L3
-	**Total**	**40**	**4**	**4**	**4**	**-**	**-**	**-**	**12**	**-**	**-**

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

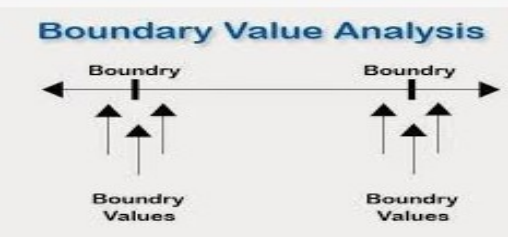
Evaluation	Weightage in Marks	CO	Levels
CIA Exam – 1	40	CO1, CO2	L5
CIA Exam – 2	40	CO2, CO3	L5
CIA Exam – 3	40	CO4,CO5,CO6	L5,L6
Assignment - 1	-	-	-
Assignment - 2	-	-	-
Assignment - 3	-	-	-
Seminar - 1	-	-	-
Seminar - 2	-	-	-
Seminar - 3	-	-	-
Other Activities – define – Slip test			
Final CIA Marks	**40**	**-**	**-**

SNo	Description	Marks
1	Observation and Weekly Laboratory Activities	5 Marks
2	Record Writing	15 Marks for each experiment
3	Internal Exam Assessment	20 Marks
4	Internal Assessment	40 Marks
5	SEE	60 Marks
-	**Total**	**100 Marks**

E. EXPERIMENTS

Experiment 01 : Boundary Value Analysis For Triangle Problem

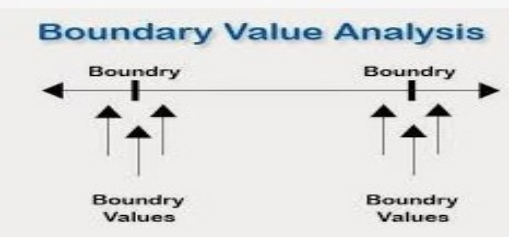
-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Boundary value analysis for triangle problem						
2	Course Outcomes	Design and evaluate test cases for Boundary value						
3	Aim	Derive a Boundary value analysis for triangle problem						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept	Boundary value analysis						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	ALGORITHM: Step 1: Input a, b & c i.e three integer values which represent three sides of the triangle. Step 2: if (a < (b + c)) and (b < (a + c)) and (c < (a + b) then do step 3 else print not a triangle. do step 6. Step 3: if (a=b) and (b=c) then Print triangle formed is equilateral. do step 6. Step 4: if (a ≠ b) and (a ≠ c) and (b ≠ c) then Print triangle formed is scalene. do						

		step 6. Step 5: Print triangle formed is Isosceles. Step 6: stop
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	To test the errors at boundaries of input domain
13	Remarks	
14	Faculty Signature with Date	

c1: a<b+c?	F	T	T	T	T	T	T	T	T	T	T
c2: b<a+c?	-	F	T	T	T	T	T	T	T	T	T
c3: c<a+b?	-	-	F	T	T	T	T	T	T	T	T
c4: a = b?	-	-	-	T	T	T	T	F	F	F	F
c5: a = c?	-	-	-	T	T	F	F	T	T	F	F
c6: b = c?	-	-	-	T	F	T	F	T	F	T	F
a1: Not a Triangle	X	X	X								
a2: Scalene											X
a3: Isosceles							X		X	X	
a4: Equilateral				X							
a5: Impossible					X	X		X			

Experiment 02 : Boundary Value Testing For Commission Problem

-	**Experiment No.:**	2	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Boundary value testing for commission problem						
2	Course Outcomes	Design and evaluate test cases for Boundary value						
3	Aim	Derive a boundary value test for commission problem						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept	Boundary value analysis						
66	Procedure, Program, Activity, Algorithm, Pseudo Code	ALGORITHM STEP 1: Define lockPrice=45.0, stockPrice=30.0, barrelPrice=25.0 STEP2: Input locks STEP3: while(locks!=-1) „input device uses -1 to indicate end of data goto STEP 12 STEP4:input (stocks, barrels) STEP5: compute lockSales, stockSales, barrelSales and sales STEP6: output("Total sales:" sales) STEP7: if (sales > 1800.0) goto STEP 8 else goto STEP 9						

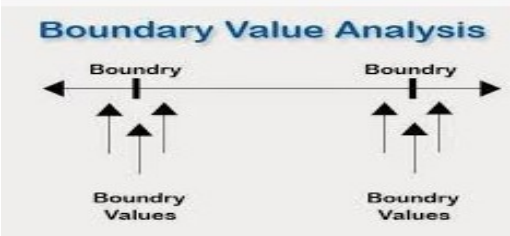
		STEP8: commission=0.10*1000.0; commission=commission+0.15 * 800.0; commission = commission + 0.20 * (sales-1800.0) STEP9: if (sales > 1000.0) goto STEP 10 else goto STEP 11 STEP10: commission=0.10* 1000.0; commission=commission + 0.15 * (sales-1000.0) STEP11: Output("Commission is $", commission) STEP12: exit
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	

TC ID	Test case description	Input Data			Sales	Expected output	Actual output	status
		Locks	Stocks	Barrels				
1	Input test cases for L=1 ,S=1 ,B=1	1	1	1	100	10	10	pass
2	Input test cases for L=1 ,S=1 ,B=2	1	1	2	125	12.5	12.5	pass
3	Input test cases for L=1 ,S=2 ,B=1	1	2	1	130	13	13	pass
4	Input test cases for L=2 ,S=1,B=1	2	1	1	145	14.5	14.5	pass
5	Input test cases for L=5 ,S=5 ,B=5	5	5	5	500	50	50	pass
6	Input test cases for L=10 ,S=10,B=9	10	10	9	975	97.5	97.5	pass
7	Input test cases for L=10 ,S=9 ,B=10	10	9	10	970	97	97	pass
8	Input test cases for L=9 ,S=10 ,B=10	9	10	10	955	95.5	95.5	pass
9	Input test cases for L=10 ,S= 10,B=10	10	10	10	1000	100	100	pass

11	Results & Analysis	
12	Application Areas	To test the errors at boundaries of input domain
13	Remarks	
14	Faculty Signature with Date	

Experiment 03 :Boundary Value Testing For Next Date Problem

-	**Experiment No.:**	3	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Boundary value testing for next date problem						
2	Course Outcomes	Design and evaluate test cases for Boundary value						
3	Aim	Derive a Boundary value testing for next date problem						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept	Boundary value analysis						
6	Procedure, Program, Activity,	STEP 1: Input date in format DD.MM.YYYY STEP2: if MM is 01, 03, 05,07,08,10 do STEP3 else STEP6						

	Algorithm, Pseudo Code	STEP3:if DD < 31 then do STEP4 else if DD=31 do STEP5 else output(Invalid Date); STEP4: tomorrowday=DD+1 goto STEP18 STEP5: tomorrowday=1; tomorrowmonth=month + 1 goto STEP18 STEP6: if MM is 04, 06, 09, 11 do STEP7 STEP7: if DD<30 then do STEP4 else if DD=30 do STEP5 else output(Invalid Date); STEP8: if MM is 12 STEP9: if DD<31 then STEP4 else STEP10 STEP10: tomorrowday=1, tommorowmonth=1, tommorowyear=YYYY+1; goto STEP18 STEP11: if MM is 2 STEP12: if DD<28 do STEP4 else do STEP13 STEP13: if DD=28 & YYYY is a leap do STEP14 else STEP15 STEP14: tommorowday=29 goto STEP18 STEP15: tommorowday=1, tomorrowmonth=3, goto STEP18; STEP16: if DD=29 then do STEP15 else STEP17 STEP17: output("Cannot have feb", DD); STEP19 STEP18: output(tomorrowday, tomorrowmonth, tomorrowyear); STEP19: exit
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	To test the errors at boundaries of input domain
13	Remarks	
14	Faculty Signature with Date	

Experiment 04 :Equivalence Class Partitioning Test For Different Types Of Triangles

-	**Experiment No.:**	4	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Equivalence class partitioning test for different types of triangles						
2	Course Outcomes	Design and evaluate test cases for equivalence class						
3	Aim	Derive a test case for different types of triangles						
4	Material /	Lab Manual						

	Equipment Required	
5	Theory, Formula, Principle, Concept	Equivalence class testing
6	Procedure, Program, Activity, Algorithm, Pseudo Code	ALGORITHM: Step 1: Input a, b & c i.e three integer values which represent three sides of the triangle. Step 2: if (a < (b + c)) and (b < (a + c)) and (c < (a + b) then do step 3 else print not a triangle. do step 6. Step 3: if (a=b) and (b=c) then Print triangle formed is equilateral. do step 6. Step 4: if (a ≠ b) and (a ≠ c) and (b ≠ c) then Print triangle formed is scalene. do step 6. Step 5: Print triangle formed is Isosceles. Step 6: stop
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	System behavior testing
13	Remarks	
14	Faculty Signature with Date	

TC ID	Test case description	a	b	c	Expected output	Actual output	status
1	WN1	5	5	5	Equilateral	Equilateral	Pass
2	WN2	2	2	3	Pass	Isosceles	Pass
3	WN3	3	4	5	Scalene	Scalene	Pass
4	WN4	4	1	2	Not a triangle	Not a triangle	Pass
5	WR1	-1	5	5	Value of a is not in the range of permitted values	Not in a range	Pass
6	WR2	5	-1	5	Value of b is not in the range of permitted values	Not in a range	Pass
7	WR3	5	5	-1	Value of is not in the range of permitted values	Not in a range	Pass
8	WR4	11	5	5	Value of a is not in the range of permitted values	Not in a range	Pass
9	WS1	-1	5	5	Value of a is not in the range of permitted values	Not in a range	Pass
10	WS2	5	-1	5	Value of b is not in the range of permitted values	Not in a range	Pass
11	WS3	5	5	-1	Value of c is not in the range of permitted values	Not in a range	Pass
12	WS4	-1	-1	5	Value of a and b is not in the range of permitted values	Not in a range	Pass

Add required experiments

Experiment 05: Equivalence Class Testing For Commission Problem

-	**Experiment No.:**	5	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Equivalence class testing for commission problem						
2	Course Outcomes	Design and evaluate test cases for equivalence class						
3	Aim	Derive test cases for commission problem						
4	Material / Equipment	Lab Manual						

	Required	
5	Theory, Formula, Principle, Concept	Equivalence class testing
6 6	Procedure, Program, Activity, Algorithm, Pseudo Code	ALGORITHM STEP 1: Define lockPrice=45.0, stockPrice=30.0, barrelPrice=25.0 STEP2: Input locks STEP3: while(locks!=-1) „input device uses -1 to indicate end of data goto STEP 12 STEP4:input (stocks, barrels) STEP5: compute lockSales, stockSales, barrelSales and sales STEP6: output("Total sales:" sales) STEP7: if (sales > 1800.0) goto STEP 8 else goto STEP 9 STEP8: commission=0.10*1000.0; commission=commission+0.15 * 800.0; commission = commission + 0.20 * (sales-1800.0) STEP9: if (sales > 1000.0) goto STEP 10 else goto STEP 11 STEP10: commission=0.10* 1000.0; commission=commission + 0.15 * (sales-1000.0) STEP11: Output("Commission is $", commission) STEP12: exit
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	

TC ID	Test case description	Input Data			Sales	Expected output	Actual output	status
		Locks	Stocks	Barrels				
1	WR1	10	10	10	$100	10	10	pass
2	WR2	-1	40	45	Program terminates	Program terminates	Program terminates	pass
3	WR3	-2	40	45	Value of locks not in the range1-70	Value of locks not in the range1-70	invalid	pass
4	WR4	71	40	45	Value of locks not in the range1-70	Value of locks not in the range1-70	964.0	pass
5	WR5	35	-1	45	Value of stocks not in the range1-80	Value of stocks not in the range1-80	394	pass
6	WR6	35	81	45	Value of stocks not in the range1-80	Value of stocks not in the range1-80	886	pass
7	WR7	10	9	10	970	97	97	pass
8	WR8	9	10	10	955	95.5	95.5	pass

11	Results & Analysis	
12	Application Areas	System behavior testing
13	Remarks	
14	Faculty Signature with Date	

Experiment 06:Equivalence Class Testing For Next Date Function

-	**Experiment No.:**	6	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Equivalence class testing for next date function						
2	Course Outcomes	Design and evaluate test cases for equivalence class						
3	Aim	Derive an Equivalence class testing for next date function						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept	Equivalence class testing						
6 6	Procedure, Program, Activity, Algorithm, Pseudo Code	ALGORITHM STEP 1: Input date in format DD.MM.YYYY STEP2: if MM is 01, 03, 05,07,08,10 do STEP3 else STEP6 STEP3:if DD < 31 then do STEP4 else if DD=31 do STEP5 else						

		output(Invalid Date); STEP4: tomorrowday=DD+1 goto STEP18 STEP5: tomorrowday=1; tomorrowmonth=month + 1 goto STEP18 STEP6: if MM is 04, 06, 09, 11 do STEP7 STEP7: if DD<30 then do STEP4 else if DD=30 do STEP5 else output(Invalid Date); STEP8: if MM is 12 STEP9: if DD<31 then STEP4 else STEP10 STEP10: tomorrowday=1, tommorowmonth=1, tommorowyear=YYYY+1; goto STEP18 STEP11: if MM is 2 STEP12: if DD<28 do STEP4 else do STEP13 STEP13: if DD=28 & YYYY is a leap do STEP14 else STEP15 STEP14: tommorowday=29 goto STEP18 STEP15: tommorowday=1, tomorrowmonth=3, goto STEP18; STEP16: if DD=29 then do STEP15 else STEP17 STEP17: output("Cannot have feb", DD); STEP19 STEP18: output(tomorrowday, tomorrowmonth, tomorrowyear); STEP19: exit
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	System behavior testing
13	Remarks	
14	Faculty Signature with Date	

Experiment 07: Decision Table Approach For Triangle Problem

-	**Experiment No.:**	7	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Decision table approach for triangle problem						
2	Course Outcomes	Design and evaluate test cases using decision table						
3	Aim	Design test cases for triangle problem using decision table						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept	Decision table						
6 6	Procedure, Program, Activity, Algorithm, Pseudo Code	Step 1: Input a, b & c i.e three integer values which represent three sides of the triangle. Step 2: if (a < (b + c)) and (b < (a + c)) and (c < (a + b) then do step 3 else print not a triangle. do step 6. Step 3: if (a=b) and (b=c) then						

<table>
<tr><td></td><td>Step 6:</td><td>Print triangle formed is equilateral. do step 6.
Step 4: if (a ≠ b) and (a ≠ c) and (b ≠ c) then
Print triangle formed is scalene. do step 6.
Step 5: Print triangle formed is Isosceles.
stop</td></tr>
<tr><td>7</td><td>Block, Circuit, Model Diagram, Reaction Equation, Expected Graph</td><td></td></tr>
<tr><td>8</td><td>Observation Table, Look-up Table, Output</td><td></td></tr>
<tr><td>9</td><td>Sample Calculations</td><td></td></tr>
<tr><td>10</td><td>Graphs, Outputs</td><td>
<table>
<tr><th>TC ID</th><th>Test case description</th><th>a</th><th>b</th><th>c</th><th>Expected output</th><th>Actual output</th><th>status</th></tr>
<tr><td>1</td><td>Testing for requirement 1</td><td>4</td><td>1</td><td>2</td><td>Not a triangle</td><td>Not a triangle</td><td>Pass</td></tr>
<tr><td>2</td><td>Testing for requirement 2</td><td>1</td><td>4</td><td>2</td><td>Not a triangle</td><td>Not a triangle</td><td>Pass</td></tr>
<tr><td>3</td><td>Testing for requirement 3</td><td>1</td><td>2</td><td>4</td><td>Not a triangle</td><td>Not a triangle</td><td>Pass</td></tr>
<tr><td>4</td><td>Testing for requirement 4</td><td>5</td><td>5</td><td>5</td><td>Equilateral</td><td>Equilateral</td><td>Pass</td></tr>
<tr><td>5</td><td>Testing for requirement 5</td><td>2</td><td>2</td><td>3</td><td>Isosceles</td><td>Isosceles</td><td>Pass</td></tr>
<tr><td>6</td><td>Testing for requirement 6</td><td>2</td><td>3</td><td>2</td><td>Isosceles</td><td>Isosceles</td><td>Pass</td></tr>
<tr><td>7</td><td>Testing for requirement 7</td><td>3</td><td>2</td><td>2</td><td>Isosceles</td><td>Isosceles</td><td>Pass</td></tr>
<tr><td>8</td><td>Testing for requirement 8</td><td>3</td><td>4</td><td>5</td><td>Scalene</td><td>Scalene</td><td>Pass</td></tr>
</table>
</td></tr>
<tr><td>11</td><td>Results & Analysis</td><td></td></tr>
<tr><td>12</td><td>Application Areas</td><td>Calculation of physical quantities</td></tr>
<tr><td>13</td><td>Remarks</td><td></td></tr>
<tr><td>14</td><td>Faculty Signature with Date</td><td></td></tr>
</table>

Experiment 08:Decision Based Testing For Commission Problem

-	**Experiment No.:**	8	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Decision based testing for commission problem						
2	Course Outcomes	Design and evaluate test cases for commission problem Decision table						
3	Aim	Derive a Decision table based test cases for commission problem						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept							
66	Procedure, Program, Activity, Algorithm, Pseudo Code	ALGORITHM Step 1: Input 3 integer numbers which represents number of Locks, Stocks and Barrels sold. Step 2: compute the total sales =(Number of Locks sold *45) + (Number of Stocks sold *30) + (Number of Barrels sold *25) Step 3: if a totals sale in dollars is less than or equal to $1000 then commission = 0.10* total Sales do step 6 Step 4: else if total sale is less than $1800 then commission1 = 0.10* 1000 commission = commission1 + (0.15 * (total sales – 1000)) do step 6 Step 5: else commission1 = 0.10* 1000 commission2 = commission1 + (0.15 * 800)) commission = commission2 + (0.20 * (total sales – 1800)) do step 6 Step 6: Print commission. Step 7: Stop.						
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph							
8	Observation Table, Look-up Table, Output							
9	Sample Calculations							

TC ID	Test case description	Locks	Stocks	barrels	Expected output	Actual output	status
1	Testing for requirement 1 Condition 1(c1)	-2	40	45	Out of range	Out of range	Pass
2	Testing for requirement 1 Condition 1(c1)	90	40	45	Out of range	Out of range	Pass
3	Testing for requirement 1 Condition 2(c2)	35	-3	45	Out of range	Out of range	Pass
4	Testing for requirement 1 Condition 2(c2)	35	100	45	Out of range	Out of range	Pass
5	Testing for requirement 1 Condition 3(c3)	35	40	-10	Out of range	Out of range	Pass
6	Testing for requirement 1 Condition 3(c3)	35	40	150	Out of range	Out of range	Pass
4	Testing for requirement 2	5	5	5	100	a1:50	Pass
5	Testing for requirement 2	15	15	15	1500	a2:175	Pass
6	Testing for requirement 2	25	25	25	2500	a3:360	Pass

10	Graphs, Outputs	

conditions	Condition entries(rules)					
C1:A<=LOCKS<=70	F	T	T	T	T	T
C1:A<=STOCKS<=70	-	F	T	T	T	T
C1:A<=BARRELSS<=90	-	-	F	T	T	T
C4:Sales<=1800	-	-	-	T	F	F
C5: Sales<=1000	-	-	-	-	T	F
C6: Sales<=1000	-	-	-	-	-	T
ACTIONS	ACTION ENTRIES					
A1: com1=0.10*sales						x
A2:com2=com1+0.15*(sales-1000)					x	
A3:com3=com2+0.20*(sales-1800)				x		
A4:out of range	x	x	x			

11	Results & Analysis	
12	Application Areas	Calculation of physical quantities
13	Remarks	
14	Faculty Signature with Date	

Experiment 09:Data Flow Testing For Commission Problem

-	**Experiment No.:**	9	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Data flow testing for commission problem						
2	Course Outcomes	Design a Decision table testing for commission problem						
3	Aim	Derive a Decision table testing for commission problem						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept							
66	Procedure, Program, Activity, Algorithm, Pseudo Code	ALGORITHM STEP 1: Define lockPrice=45.0, stockPrice=30.0, barrelPrice=25.0 STEP2: Input locks STEP3: while(locks!=-1) „input device uses -1 to indicate end of data goto STEP 12 STEP4:input (stocks, barrels) STEP5: compute lockSales, stockSales, barrelSales and sales STEP6: output("Total sales:" sales) STEP7: if (sales > 1800.0) goto STEP 8 else goto STEP 9 STEP8: commission=0.10*1000.0; commission=commission+0.15 * 800.0; commission = commission + 0.20 * (sales-1800.0) STEP9: if (sales > 1000.0) goto STEP 10 else goto STEP 11 STEP10: commission=0.10* 1000.0; commission=commission + 0.15 * (sales-1000.0) STEP11: Output("Commission is $", commission) STEP12: exit						
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph							
8	Observation Table, Look-up Table, Output							
9	Sample Calculations							
10	Graphs, Outputs							

11	Results & Analysis	
12	Application Areas	Calculation of physical quantities
13	Remarks	
14	Faculty Signature with Date	

Experiment 10: Binary Search Algorithm

-	**Experiment No.:**	10	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Derive test cases for binary search algorithm						
2	Course Outcomes	Design and evaluate test cases for binary search algorithm						
3	Aim	Derive test cases for binary search algorithm						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept	**Independent Paths:** #Edges=11, #Nodes=9, #P=1 **V(G)**= E-N+2P = 11-9+2 = **4** **P1**: 1-**2**-3-8-9 **P2**: 1-**2**-3-4-5-7-**2** **P3**: 1-**2**-3-4-6-7-**2** **P4**: 1-**2**-8-9						

6 6	Procedure, Program, Activity, Algorithm, Pseudo Code	Step 1: Input value of „n". Enter „n" integer numbers in array int mid;
		Step 2: Initialize low = 0, high = n -1
		Step 3: until (low <= high) do
		mid = (low + high) / 2
		if (a[mid] == key)
		then do Step 5
		else if (a[mid] > key)
		then do
		high = mid - 1
		else
		low = mid + 1
		Step 4: Print unsuccessful search do step 6.
		Step 5: Print Successful search. Element found at position mid+1.
		Step 6: Stop.						

7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph							
	Observation Table, Look-up Table, Output							
9	Sample Calculations							

10	Graphs, Outputs	

TC ID	Test case description	Locks	Stocks	barrels	Expected output	Actual output	status
1	Testing for requirement 1 path p1	0	-	5	Key not found	Wrong input	Pass
2	Testing for requirement 2 Path p2	4	2,3,5,6,7	5	Key found at pos3	Successful search	Pass
3	Testing for requirement 2 Path p3	3	1,2,5	6	Key not found	Successful search	Pass
4	Testing for requirement 2 Path p4	3	1,2,5	1	Key not found	Successful search	Fail
5	Testing for requirement 2 Path p4+p2-p1	5	1,2,4,6,7	2	Key found at pos2	Successful search	Pass
6	Testing for requirement 2 Path p3+p2-p1	5	4,5,7,8,9	8	Key found at pos4	Successful search	Pass

11	Results & Analysis	
12	Application Areas	DNA sequences
13	Remarks	
14	Faculty Signature with Date	

Experiment 11: Quick Sort Algorithm

-	**Experiment No.:**	11	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Derive a basis paths for quick sort algorithm						
2	Course Outcomes	Evaluate basis paths for quick sort algorithm						
3	Aim	Derive a basis paths for quick sort algorithm						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept							
6	Procedure, Program, Activity, Algorithm, Pseudo Code							
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph							
8	Observation Table, Look-up Table, Output							

TC ID	Test case description	Array elements	Expected output	Actual output	status
1	Testing for path p1	5,7,4,2,1,3	2,1,3,5,7,4	Key not found	Pass
2	Testing for Path p2	5,4,8,2,7	5,4,2,7,8	Key not found	Pass
3	Testing for Path p3	5,4,6,7,3	3,4,6,7,5	Key not found	Pass

9	Sample Calculations	
10	Graphs, Outputs	

TC ID	Test case description	Array elements	Expected output		Actual output	status
			array	Value of i		
1	Testing for path p1	5	5	0	Key not found	Pass
2	Testing for Path p2	5,4,6,2,7	5,4,6,2,7	4	Key not found	Pass
3	Testing for Path p3	5,4,6,7,5	5,4,6,7,5	0	Key not found	Pass

11	Results & Analysis	
12	Application Areas	Image processing
13	Remarks	
14	Faculty Signature with Date	

Experiment 12: Absolute Letter Grading

-	**Experiment No.:**	12	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Implement an absolute letter grading procedure						
2	Course Outcomes	Design and evaluate test cases for absolute letter grading						
3	Aim	Design and evaluate test cases for absolute letter grading						
4	Material / Equipment Required	Lab Manual						
5	Theory, Formula, Principle, Concept							
6	Procedure, Program, Activity, Algorithm, Pseudo Code							
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	#Edges=25, #Nodes=18, #P=1 V(G)= E-N+2P = 25-18+2 = 09 P1: 1-2-4-6-8-10-11-17-19-20 E Grade P2: 1-2-4-6-8-9-11-16-19-20 D Grade P3: 1-2-4-6-7-11-15-19-20 C Grade P4: 1-2-4-5-11-14-19-20 B Grade P5: 1-2-3-11-13-19-20 A Grade P6: 1-2-4-6-8-10-11-13-19-20 P7: 1-2-4-6-8-10-11-14-19-20 P8: 1-2-4-6-8-10-11-15-19-20 P9: 1-2-4-6-8-10-11-16-19-20						
8	Observation Table, Look-up Table, Output							
9	Sample Calculations							
10	Graphs, Outputs							
11	Results & Analysis							
12	Application Areas							
13	Remarks							
14	Faculty Signature with Date							

Paths	Input Per	Expected Output	Remarks
P1: 1-2-4-6-8-10-11-17-19-20	< 60	E Grade, Satisfactory	Pass
P2: 1-2-4-6-8-9-11-16-19-20	60-69	D Grade, Above Average	Pass
P3: 1-2-4-6-7-11-15-19-20	70-79	C Grade, Good	Pass
P4: 1-2-4-5-11-14-19-20	80-89	B Grade, Very Good	Pass
P5: 1-2-3-11-13-19-20	>= 90	A Grade, Excellent	Pass
P6: 1-2-4-6-8-10-11-13-19-20	< 60	Excellent	Fail
P7: 1-2-4-6-8-10-11-14-19-20	< 60	Very Good	Fail
P8: 1-2-4-6-8-10-11-15-19-20	< 60	Good	Fail
P9: 1-2-4-6-8-10-11-16-19-20	< 60	Above Average	Fail

F. Content to Experiment Outcomes

1. TLPA Parameters

Table 1: TLPA – ST LAB Course

Expt-#	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Design and develop a program in a language of your choice to solve the triangle problem	3	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
2	Design, develop, code and run the program in any suitable language to solve the commission problem	3	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
3	Design, develop, code and run the program in any suitable language to implement the NextDate function	3	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
4	**Design and develop a program in a language of your choice to solve the triangle problem**	3	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
5	Design, develop, code and run the program in any suitable language to solve the commission problem	3	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
6	Design, develop, code and run the program in any suitable language to implement the NextDate function	3	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
7	**Design and develop a program in a language of your choice to solve** the Triangle problem	3	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
8	Design, develop, code and run the program in any suitable language to solve the commission problem	3	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
9	Design, develop, code and run the program in any suitable language to solve the commission problem	4	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
10	Design, develop, code and run the program in any suitable language to implement the binary search algorithm	4	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
11	Design, develop, code and run the program in any suitable language to implement the quicksort algorithm	4	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A
12	Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions	4	L5 evaluate	L5 evaluate	Design and develop	Demonstrate process	Small group discussions. Q & A

2. Concepts and Outcomes:

Table 2: Concept to Outcome – ST Course

Expt - #	Learning or Outcome from study of the Content or	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content /	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology,	Course Outcome **Student Should be able to ...**

	Syllabus			Syllabus. A short word for learning or outcome)	4.Benchmark)	
A	I	J	K	L	M	N
1	Boundary value	Boundary value	Boundary value	Testing Technique	Design and develop Testing Technique Boundary value	Design and evaluate test cases for boundary value
2	Equivalence class	Equivalence class	Equivalence class	Testing Technique	Design and develop Testing Technique Equivalence class	Design and evaluate test cases for equivalence class
3	Decision table	Decision table	Decision table	Testing Technique	Design and develop Testing Technique Decision table	Design and evaluate test cases for decision table
4	binary search algorithm	binary search algorithm	binary search algorithm	Testing Technique	Design and develop Testing Technique binary search algorithm	Design and evaluate test cases for binary search algorithm
5	quick sort algorithm	quick sort algorithm	quick sort algorithm	Testing Technique	Design and develop Testing Technique quick sort algorithm	Design and evaluate test cases for quick sort algorithm
6	absolute letter grading	absolute letter grading	absolute letter grading	Testing Technique	Design and develop Testing Technique absolute letter grading	Design and evaluate test cases for absolute letter grading