



Individual Time Table

Term I

Time Slot	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8:40-9:20	FY-BSC (C)			SY	SY	
9:20-10		FY (MI)	FY	practical	practical	
10-10:40						
12:15-1:10	FY-BSC	FY	FY	SY (MI)		
1:10-1:50	Practical	practical	practical		SY (MI)	
2:-2:40	SY-BSC (C)					

Total Workload:

= Theory (No. of lectures per week) + Practical (No. of lectures per turn)

$$2(6) + 10(4) = 46$$

Term II

Time Slot	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8:30-8:40						
8:40-9:20	FY-M-II		SY	SY	SY	
9:20-9:50		FY-M-II	pract	pract	pract	
10:00-10:40						
10:40-11:20		FY practical	FY-M-II			
11:20-11:50			SY practical	MI (SY)	MI SY	
1:10-1:50	M-I (SY)					

Total Workload:

= Theory (No. of lectures per week) + Practical (No. of lectures per turn)

$$2(6) + 12(4) = 48$$



[Signature]
Principal
P.V.G.'s College of Science
Vidyanagari, S. No. 44, Parvati
Pune - 411 009

Individual Time Table

Term I

Time Slot	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8:40-9:20	FY-BSC(CS)			SY	SY	
9:20-10:00		FY (MII)	FY	practical	practical	
10-10:40						
12:10-1:10	FY-BSC	FY	FY	SY (MI)		
1:10-1:50	practical	practical	practical		SY (MI)	
2: - 2:40	SY-BSC(CS)					

Total Workload:

= Theory (No. of lectures per week) + Practical (No. of lectures per turn)

$$2(6) + 10(4) = 46$$

Term II

Time Slot	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8:00-8:40						
8:40-9:20	FY-M-II					
9:20-9:50		FY-M-II				
10:00-10:40						
10:40-11:20		FY practical	FY-M-II			
11:20-11:50			SY practical	MI (SY)	MI SY	
1:10-1:50	M-II (SY)					

Total Workload:

= Theory (No. of lectures per week) + Practical (No. of lectures per turn)

$$2(6) + 12(4) = 48$$



Savitribai Phule Pune University

(Formerly University of Pune)

Three Year B.Sc. Degree Program in Mathematics

(Faculty of Science & Technology)

F.Y.B.Sc. Mathematics (Computer Science)

Choice Based Credit System Syllabus

To be implemented from Academic Year 2019-2020

Title of the Course : B.Sc. Mathematics (Computer Science)

Preamble:

Savitribai Phule Pune University has decided to change the syllabi of various faculties from June, 2019. Taking into consideration the rapid changes in science and technology and new approaches in different areas of mathematics and related subjects board of studies in mathematics with concern of teachers of mathematics from different colleges affiliated to Savitribai Phule Pune University has prepared the syllabus of F. Y. B.Sc. (Computer Science) Mathematics. To develop the syllabus the U.G.C. Model curriculum is followed.

Aims:

- (i) Give the students a sufficient knowledge of fundamental principles, methods and a clear perception of innumerable power of mathematical ideas and tools and know how to use them by modeling, solving and interpreting.
- (ii) Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science and technology.
- (iii) Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- (iv) Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

Objectives:

- (i) A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
- (ii) A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- (iii) A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.
- (iv) A student be able to apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
- (v) A student should be made aware of history of mathematics and hence of its past, present and future role as part of our culture.

Course Outcome:

Upon successful completion of this course, the student will be able to:

- i) A students should be able to work with graphs and identify certain parameters and properties of the given graphs.
- ii) A students should be able to perform certain algorithms, justify why these algorithms work, and give some estimates of the running times of these algorithms.
- iii) A students should be able to solve basic exercises of the type: given a graph with properties X, prove that the graph also has property Y.
- iv) A students should develop an appreciation for the literature on the subject and be able to read and present results from the literature.
- v) A students should be able to write cohesive and comprehensive solutions to exercises and be able to defend their arguments.

Structure of the course:-

	Semester - I		Semester -II	
Paper I	MTC-111	Matrix Algebra	MTC-121	Linear Algebra
Paper II	MTC-112	Discrete Mathematics	MTC-122	Graph Theory
Paper III	MTC-113	Mathematics Practical	MTC-123	Mathematics Practical

Proposed Structure of S. Y. B. Sc. Mathematics (Computer Science) Courses:

	Semester - III		Semester -IV	
Paper I	MT-231	Group Theory	MT-241	Calculus
Paper II	MT-232	Numerical Analysis	MT-242	Operations Research
Paper III	MT-233	Mathematics Practical	MT-243	Mathematics Practical

All three above courses are compulsory.

Equivalence of Previous syllabus along with new syllabus:

	Old course	New Course
Paper I	MTC-101 : Discrete Mathematics	MTC-111: Matrix Algebra and MTC-121 : Linear Algebra

Paper II	MTC-102 : Algebra and Calculus	MTC-112 : Discrete Mathematics and MTC-122 : Graph Theory
Paper III	MTC-103 : Mathematics Practical	MTC – 113 : Mathematics Practical and MTC – 113 : Mathematics Practical

Detailed Syllabus:

Semester - I

MTC-111: Matrix Algebra

Unit 1 : Introduction (4 lectures)

- 1.1 Matrix Operations
- 1.2 The Inverse of a Matrix
- 1.3 Characterization of invertible matrices

Unit 2 : Linear Equations in Linear Algebra-I (12 lectures)

- 2.1 System of Linear equations
- 2.2 Row reduction and echelon forms
- 2.3 Vector equations
- 2.4 The matrix equation $Ax=b$
- 2.5 Solution sets of linear systems

Unit 3 : Linear Equations in Linear Algebra -II (12 lectures)

- 3.1 Partitioned Matrices
- 3.2 Matrix factorization [Lu decomposition]
- 3.3 Linear Independence
- 3.4 Introduction to linear transformation
- 3.5 The matrix of linear transformation
- 3.6 Subspaces of R^n
- 3.7 Dimension and Rank

Unit 4 : Determinants (8 lectures)

- 4.1 Introduction to determinants
- 4.2 Properties of determinants

4.3 Cramer's rule, Volume and linear transformations

Text Book : Linear Algebra and its Applications, David C Lay, Steven R. Lay, Judi J. MacDonald Pearson Publication, 2016, Fifth Edition.

Unit 1: Chapter 2: Sec. 2.1, 2.2, 2.3

Unit 2: Chapter 1: Sec. 1.1, 1.2, 1.3, 1.4, 1.5

Unit 3: Chapter 2: Sec. 2.4, 2.5, 2.8, 2.9, Chapter 1: 1.7, 1.8, 1.9

Unit 4: Chapter 3: Sec. 3.1, 3.2, 3.3

Reference Books :

1. Elementary Linear Algebra with supplemental Applications, Howard Anton and others, Wiley Student Edition.
2. Matrix and Linear Algebra (aided with MATLAB), Kanti Bhushan Datta, Eastern Economic Edition.

MTC 112: Discrete Mathematics**UNIT 1 : LOGIC****(7 Lectures)**

- 1.1 Revision : Propositional Logic, Propositional Equivalences.
- 1.2 Rules of Inference : Argument in propositional Logic, Validity Argument (Direct and Indirect methods) Rules of Inference for Propositional Logic, Building Arguments.
- 1.3 Predicates and Quantifiers : Predicate, n-Place Predicate or n-ary Predicate, Quantification and Quantifiers, Universal Quantifier, Existential Quantifier, Quantifiers with restricted domains, Logical Equivalences involving Quantifiers.

Unit 2 : Lattices and Boolean Algebra**(13 Lectures)**

- 2.1 Relations, types of relations, equivalence relations, Partial ordering relations
- 2.2 Digraphs of relations, matrix representation and composition of relations.
- 2.3 Transitive closure and Warshall's Algorithm
- 2.3 Poset, Hasse diagram.
- 2.4 Lattices, Complemented lattice, Bounded lattice and Distributive lattice.
- 2.5 Boolean Functions : Introduction, Boolean variable, Boolean Function of degree n, Boolean identities, Definition of Boolean Algebra.
- 2.6 Representation of Boolean Functions : Minterm, Maxterm Disjunctive normal form, Conjunctive normal Form.

Unit 3 : Counting Principles**(7 Lectures)**

- 3.1 Cardinality of Set : Cardinality of a finite set.
- 3.2 Basics of Counting : The Product Rule, The Sum Rule, The Inclusion- Exclusion Principle.
- 3.3 The Pigeonhole Principle: Statement, the Generalized Pigeonhole Principle, Its Applications.

- 3.4 Generalized Permutations and Combinations : Permutation and
3.5 Combination with Repetitions, Permutations with Indistinguishable Objects

Unit 4: Recurrence Relations (9 Lectures)

- 4.1 Recurrence Relations: Introduction, Formation.
4.2 Linear Recurrence Relations with constant coefficients.
4.3 Homogeneous Solutions.
4.4 Particular Solutions.
4.5 Total Solutions.

TextBooks:

1. Discrete Mathematics and its applications, by Kenneth Rosen, Tata McGraw Hill, Seventh Edition.
2. Discrete Mathematical Structures, by Kolman, Busby, Ross, Rehman, Prentice Hall,
3. Elements of Discrete Mathematics, by C. L. Liu, Tata McGraw Hill,

- Unit 1: Text Book 1: Chapter 1: Sec. 1.1, 1.2, 1.3, 1.4, 1.5
Unit 2: Text Book 2: Chapter 6: Sec. 6.1, 6.2, 6.3, 6.4, 6.5
Unit 3: Text Book 1: Chapter 2: Sec. 2.1, Chapter 5: Sec.5.1, 5.2, 5.3
Unit 4: Text Book 3: Chapter 10: Sec. 10.1, 10.2, 10.3, 10.4, 10.5, 10.6

MTC 113: Mathematics Practical

(Practical based on the applications of articles in MTC-111 and MTC - 112)

In Semester-I, we should conduct 3 written practical and 3 practical on maxima software for each paper MTC -111 and MTC -112.

List of Practical

- Practical 1 : Problems on Unit 1 and 2 (Written) from MTC-111.
Practical 2 : Problems on Unit 3 (Written) from MTC-111.
Practical 3 : Problems on Unit 4 (Written) from MTC-111.
Practical 4 :Introduction to maxima software for MTC-111.
Practical 5 : Problems on unit 1 and unit 2 from MTC-111using maxima software.
Practical 6 : Problems on Unit 3 and Unit 4 from MTC-111using maxima software.
Practical 7: Problems on Unit 1 and Unit 2(Written) from MTC-112.
Practical 8 : Problems on Unit 3 (Written) from MTC-112.
Practical 9 : Problems on Unit 4(Written) from MTC-112.
Practical 10 :Introduction to maxima software for MTC-112.
Practical 11 : Problems on unit 1 and unit 2 from MTC-112 using maxima software.
Practical 12 : Problems on Unit 3 and Unit 4 from MTC-112 using maxima software.

Note:

1. The soft copy of practical on maxima software will be prepared and provided by the Board of Studies in mathematics.
2. Practical on maxima software can be performed on computer and android mobiles.
3. Android mobiles are allowed for practical examination on maxima software.
4. Practical examination of 25 marks on written problems, 10 marks for problems on maxima software (5 marks for writing syntax and 5 marks to perform the same on android mobile or computer).

Semester -II

MTC-121: Linear Algebra

Unit 1: Vector Spaces

(10 lectures)

- 1.1 Vector spaces and subspaces
- 1.2 Null spaces, column spaces and linear transformations.
- 1.3 Linearly independent sets : Bases
- 1.4 Coordinate systems
- 1.5 The dimension of a vector space
- 1.6 Rank

Unit 2: Eigen values and Eigen vectors

(10 lectures)

- 2.1 Eigen values and Eigen vectors
- 2.2 The characteristic equation
- 2.3 Diagonalization
- 2.4 Eigen vectors and Linear transformations

Unit 3: Orthogonality and Symmetric Matrices

(10 lectures)

- 3.1 Inner product, length and orthogonality
- 3.2 Orthogonal sets
- 3.3 Orthogonal Projections
- 3.4 Diagonalization of Symmetric Matrices
- 3.5 Quadratic forms

Unit 4: The Geometry of vector spaces

(6lectures)

- 4.1 Affine combinations
- 4.2 Affine independence
- 4.3 Convex combinations

Text Book :

Linear Algebra and Its Applications (5th Edition) David C Lay, Steven R. Lay, Judi J. MacDonald Pearson Publication, Fifth Edition, 2016.

Unit 1: Chapter 4: Sec. 4.1, 4.2, 4.3, 4.4, 4.5, 4.6

Unit 2: Chapter 5: Sec. 5.1, 5.2, 5.3, 5.4

Unit 3: Chapter 6: Sec. 6.1, 6.2, 6.3, Chapter 7: 7.1, 7.2

Unit 4: Chapter 8: Sec. 8.1, 8.2*, 8.3

*From section 8.2 omit Barycentric coordinates.

Reference Books:

1. Elementary Linear Algebra with supplemental Applications, by Howard Anton and others, Wiley Student Edition, Fourth edition.
2. Matrix and Linear Algebra (aided with MATLAB), by Kanti Bhushan Datta, Eastern Economic Edition, Fourth edition.

MTC-122: Graph Theory**Unit 1: An Introduction to graph****(10 lectures)**

- 1.1. Definitions, Basic terminologies and properties of graph, Graph models.
- 1.2. Special types of graphs, basic terminologies, properties and examples of directed graphs. Types of diagraphs.
- 1.3. Some applications of special types of graph.
- 1.4. Matrix representation and elementary results, Isomorphism of graphs.

Unit 2: Connected graph**(8 lectures)**

- 2.1. Walk, trail, path, cycle, elementary properties of connectedness. Counting paths between vertices (by Warshall's algorithm).
- 2.2. Cut edge (Bridge), Cut vertex, cut set, vertex connectivity, edge connectivity, and Properties.
- 2.3. Shortest path problem, Dijkstra's algorithm.

Unit 3. Euler and Hamilton path.**(8 lectures)**

- 3.1. The Konigsberg bridge problem, Euler trail, path, circuit and tour, elementary properties and Fleury's algorithm.
- 3.2. Hamilton path, circuit, elementary properties and examples.
- 3.3. Introduction of Travelling salesman problem, Chinese postman problem.

Unit 4. Trees**(10 lectures)**

- 4.1. Definitions, basic terminologies, properties and applications of trees.
- 4.2. Weighted graph, definition and properties of spanning tree, shortest spanning tree, Kruskal's algorithm, Prim's algorithm.

4.3. M-ary tree, binary tree, definitions and properties, tree traversal: preorder, inorder, postorder, infix, prefix, postfix notations and examples.

Text Book:

Kenneth Rosen, Discrete Mathematics and its applications, Tata McGraw Hill, Seventh Edition.

Unit 1: Chapter 8: Sec. 8.1, 8.2, 8.3

Unit 2: Chapter 8: Sec. 8.4

Unit 3: Chapter 8: Sec. 8.5, 8.6

Unit 4: Chapter 9: Sec. 9.1,9.2,9.3,9.4,9.5.

Reference Books:

1. John Clark and Derek Holton, A first look at Graph theory, Allied Publishers.
 2. NarsinghDeo, Graph Theory with applications to computer science and engineering, Prentice Hall.
 3. C.L.Liu, Elements of Discrete Mathematics, Tata McGraw Hill, Fourth edition
 4. Douglas B. West, Introduction to Graph Theory, Pearson Education, second edition.
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MTC 123: Mathematics Practical

(Practical based on the applications of articles in MTC- 121 and MTC- 122)

In Semester- II, we should conduct 4 written practical and 2 practical on maxima software for each paper MTC-121 and MTC-122.

List of Practical

Practical 1 : Problems on Unit 1 (Written) from MTC-121.

Practical 2 : Problems on Unit 2 (Written) from MTC-121.

Practical 3 : Problems on Unit 3(Written) from MTC-121.

Practical 4 :Problems on Unit 4(Written) from MTC-121.

Practical 5 : Problems on unit 1 and unit 2 from MTC-121using maxima software.

Practical 6 : Problems on Unit 3 and Unit 4 from MTC-121using maxima software.

Practical 7: Problems on Unit 1 (Written) from MTC-122.

Practical 8 : Problems on Unit 2 (Written) from MTC-122.

Practical 9 : Problems on Unit 3 (Written) from MTC-122.

Practical 10 :Problems on Unit 4 (Written) from MTC-122.

Practical 11 : Problems on unit 1 and Unit 2 from MTC-122 using maxima software.

Practical 12: Problems on Unit 3 and Unit 4 from MTC-122 using maxima software.

Note:

- 1 The soft copy of practical on maxima software will be prepared and provided by the Board of Studies in mathematics.
2. Practical on maxima software can be performed on computer and android mobiles.
3. Android mobiles are allowed for practical examination on maxima software.
4. Practical examination 25 marks on written problems, 10 marks for problems on maxima software (5 marks for writing syntax and 5 marks to perform the same on android mobile or computer).

Modalities For Conducting The Practical and The Practical Examination:

- 1) There will be one 3 hour practical session for each batch of 15 students per week.
- 2) The College will conduct the Practical Examination at least 15 days before the commencement of the Main Theory Examination. The practical examination will consist of written examination of 20 marks, 10 marks on maxima software and oral examination of 05 marks.
- 3) There will be no external examiner, the practical exam will be of the duration of 3 hours.
- 4) The subject teacher will set a question paper based on pattern as follows:
 - Q1. Any 2 out of 4 each question of 5 marks on paper - I.
 - Q2. Any 2 out of 4 each question of 5 marks on paper - II.
 - Q3. (a) Any 1 out of 2 each question of 5 marks on maxima software from paper - I.
(b) Any 1 out of 2 each question of 5 marks on maxima software from paper - II.
- 5) Each student will maintain a journal to be provided by the college.
- 7) The internal 15 marks will be given on the basis of journal prepared by student and the cumulative performance of student at practical.
- 8) It is recommended that concept may be illustrated using computer software maxima and graphing calculators wherever possible.
- 9) Study tours may be arranged at places having important mathematical institutes or historical places.
- 10) **Special Instruction:**
 - a) There should be well equipped mathematics practical laboratory of size 20 X 20 sq. fts containing at least 10 computers.
 - b) Examiners should set separate question papers, solutions and scheme of marking for each batch and claim the remuneration as per rule.
 - c) Before starting each practical necessary introduction, basic definitions, intuitive inspiring ideas and prerequisites must be discussed.

Teaching Plan

for Second Half of Academic Year : 2022-23

Class : F.Y. BSC (CS)

Subject Code : MTC 122

Semester : 2

Subject Title : Graph Theory.

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	20/2/23 to 25/2/23	Ch:1 Introduction to graphs Basic concepts; degree sequence.
2	27/2/23 to 04/03/23	Graphical degree seq ⁿ , Isomorphism, subgraphs.
3	06/03/23 to 11/03/23	Deletion of vertex, deletion of edges, Spanning subgraphs, induced subgraphs.
4	13/03/23 to 18/03/23	operations on graphs, union, intersection, ring sum, product.
5	20/03/23 to 25/03/23	Decomposition of graphs, fusion of graphs, complement & self complement.
6	27/03/23 to 01/04/23	Ch:2 : Connected graphs walk, trail, path, cycle
7	03/04/23 to 08/04/23	distance bet ⁿ pair of vertices. Eccentricity of vertex, centre & radius
8	10/04/23 to 15/04/23	Ch:3 Eulerian & Hamiltonian graph.
9	17/04/23 to 22/04/23	Euler's graph & Hamiltonian graph. Fleury algorithm.
10	24/04/23 to 29/04/23	Ch:4 tree.
11	01/05/23 to 06/05/23	properties of tree, spanning tree, Binary tree.
12	08/05/23 to 13/05/23	tree traversal.

Name of the subject Teacher : Prof. Mohini Pandeshi

Signature of the subject Teacher : Pandeshi

P.V.G's College of Science, Pune 411009

Teaching Plan

for First Half of Academic Year : 2022-23

Class: S.Y.B.Sc(CS)

Subject Code: MTC-231

Semester: 2

Subject Title: Groups & Coding theory-I.

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	26-9-22 to 30-9-22	chap. 1. Integers.
2	3-10-22 to 7-10-22	chap. 1. Division algorithm
3	10-10-22 to 14-10-22	chap. 1. Euclid's lemma.
4	17-10-22 to 21-10-22	chap. 2 Groups.
5	31-10-22 to 4-11-22	chap. 2 Groups.
6	7-11-22 to 11-11-22	chap. 3 Finite groups & subgroups order of group.
7	14-11-22 to 18-11-22	chap. 3 subgroup def ⁿ , generates permutation group.
8	21-11-22 to 25-11-22	chap. 3 cosets, def ⁿ , example properties.
9	28-11-22 to 2-12-22	chap. 4. Coding of Binary & Error detection.
10	5-12-22 to 9-12-22	chap. 4. decoding & Error correction.
11	12-12-22 to 16-12-22	chap. 4. public key Crypto- graphy.

Prof. Mohini Pardehi
Name of the subject Teacher :

Pardehi
Signature of the subject Teacher :

Theory Course (Term I) Implementation Details

Class: S.Y. B.Sc. (CS)

Class Strength: 153

Subject Code: MTC 231 Subject Title: Groups & Coding theory

Sr. No.	Date	Time	Topics taught	No. of students present
1	28/9	1:10-1:50	division algorithm.	114
2	29/9	2:40-3:20	H.C.D. & Euclid's lemma.	110
3	3/10	1:10-1:50	Equivalence relation.	106
4	6/10	12:30-1:10	Equivalence, congruence relation.	108
5	10/10	1:10-1:50	groups: Introduction	114
6	13/10	1:10-1:50	definition & Examples	105
7	14/10	12:30-1:10	definition & Examples	101
8	17/10	1:10-1:50	elementary properties of groups	95
9	20/10	1:10-1:50	Elementary properties of groups.	98
10	21/10	12:30-1:10	3: Finite groups & subgroups.	96
11	31/10	1:10-1:50	order of a group, order of an element.	89
12	2/11	12:30-1:10	Examples of $(G, +)$ (groups).	85
13	8/11	1:10-1:50	Subgroup definition.	87
14	4/11	1:10-1:50	generator, subgroups of	96
15	11/11	12:30-1:10	2n. cyclic group.	90
16	12/11	1:10-1:50	subgroup thm & cyclic examples.	86
17	14/11	1:10-1:50	composition of two permutations.	81
18	17/11	12:30-1:10	Product of disjoint cycles.	78
19	18/11	1:10-1:50	inverse, order of permutation.	90

Sr. No.	Date	Time	Topics taught	No. of students present
20	19/11	1:10-1:50	inverse permutation	84
21	21/11	12:30-1:10	even/odd permutation cosets	86
22	24/11	1:10-1:50	ch. 4: - groups & coding theory	80
23	25/11	1:10-1:50	coding binary operation	81
24	28/11	12:30-1:10	Decoding & Error correction	84
25	1/12	1:10-1:50	public key cryptography	80
26	2/12	1:10-1:50	Public key cryptography.	78
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				

Internal Exam / Assessment Details (UG)

Class: S.Y. B.Sc. CC3

Subject Code: MTC231

Class Strength: 153

Subject Title: Group 4 Living Theory

Roll No.	Marks out of	Marks out of	Roll No.	Marks out of	Marks out of	Roll No.	Marks out of	Marks out of
1	15	15	31	15	15	61	14	14
2	15	15	32	14	14	62	13	13
3	06	14	33	15	15	63	14	14
4	13	13	34	15	15	64	15	15
5	13	14	35	15	15	65	14	14
6	14	14	36	15	15	66	12	12
7	15	15	37	15	15	67	13	13
08	05	13	38	15	15	68	12	12
9	12	13	39	10	11	69	14	14
10	14	14	40	15	15	70	14	14
11	15	15	41	15	15	71	14	14
12	15	15	42	12	12	72	11	12
13	15	15	43	14	14	73	15	15
14	15	15	44	14	14	74	15	15
15	15	15	45	14	14	75	15	15
16	15	15	46	13	13	76	15	15
17	15	15	47	13	13	77	14	14
18	15	15	48	12	12	78	14	14
19	12	13	49	12	12	79	14	14
20	15	15	50	14	14	80	13	13
21	15	15	51	13	13	81	15	15
22	12	13	52	14	14	82	15	15
23	10	12	53	14	14	83	15	15
24	13	13	54	15	15	84	13	13
25	13	13	55	11	12	85	15	15
26	09	12	56	10	12	86	14	14
27	15	15	57	10	12	87	13	13
28	13	13	58	11	12	88	15	15
29	14	14	59	13	13	89	11	12
30	15	15	60	09	12	90	10	12

Internal Exam / Assessment Details (UG)

Class: SY-B.Sc (CS) Class Strength: 153
 Subject Code: MTC(231) Subject Title: Group A Coding

Roll No.	Marks out of	Marks out of	Roll No.	Marks out of	Marks out of	Roll No.	Marks out of
91	15	15	121	15	15	151	13
92	13	13	122	15	15	152	14
93	14	14	123	15	15	153	14
94	14	14	124	15	15		
95	14	14	125	15	15		
96	15	15	126	09	12		
97	14	14	127	14	14		
98	14	14	128	15	15		
99	15	15	129	14	14		
100	13	13	130	14	14		
101	15	15	131	13	13		
102	03	12	132	12	12		
103	14	14	133	15	15		
104	15	15	134	14	14		
105	15	15	135	12	12		
106	15	15	136	14	14		
107	14	14	137	15	15		
108	14	14	138	14	14		
109	14	14	139	12	12		
110	13	13	140	13	13		
111	15	15	141	12	13		
112	15	15	142	12	13		
113	09	12	143	15	15		
114	14	14	144	15	15		
115	15	15	145	15	15		
116	13	13	146	13	13		
117	13	13	147	13	13		
118	12	12	148	12	13		
119	14	14	149	12	13		
120	15	15	150	13	13		

Rahul

Practical Course (Term I) Implementation Details

Class: S.Y.B.S.C(CS) Batch: 516 Batch Strength:

Subject Code: MFL229 Subject Title: Mathematics Practical

Slot	Date	Time	Assignment(s) taken during the slot	No. of students present
1		9:30-11:00	practical 4,5	30
2		9:30-11:00	Practical, 6,7	29
3		9:30-11:00	Practical, 8,9,	37
4		9:30-11:00	practical. 10,11	28
5		9:30-11:00	practical. 1,2,3,4	31.
6		9:30-11:00		
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Supervisor's Sign
with date

P.V.G's College of Science & Commerce, Pune - 411009
Internal Exam (second Half of Academic Year 2022-23)

B F 2 Mill

For Staff use only

Marks out of 15: _____

Examiner's Sign:

Examiner's Name: Prof. Mohini Pardeshi

Seat No. _____

Class: F.Y.B.Sc. (Computer Science)

Subject: MTC-222 Graph Theory

Date: 15/05/2023

- *Scratching & Overwriting is not permitted.*
- *Answer must be written in the box for evaluation.*
- *For empty boxes, no marks will be granted.*

Q.1 Choose the correct alternative

[1 x 15 = 15 marks]

i) In a _____ the degree of each and every vertex is equal.

- a) Regular Graph b) Point Graph
c) Star Graph d) Wheel Graph

ii) All closed walks are of _____ length in a bipartite graph.

- a) Infinite b) Even
c) Odd d) Odd Prime

iii) A bridge cannot be a part of _____

- a) A simple Cycle b) a clique with size ≥ 3 whose every edge is a bridge
c) Tree d) a graph which contains cycles

iv) Every isomorphic graph must have _____ representation.

- a) Cyclic b) adjacency list
c) Tree d) adjacency Matrix

v) A cycle on n vertices is isomorphic to its complement. What is the value of n ?

- a) 5 b) 32
c) 17 d) 8

vi) A graph is a set of?

- a) Vertices & Edges b) Rows & Columns
c) Equations d) Both a & b

vii) In a _____ the vertex set and the edge set are finite sets.

- a) finite graph b) bipartite graph
c) infinite graph d) connected graph

viii) We use Dijkstra's Algorithm to ...

- a) non-weighted non-negative b) weighted non-negative
c) weighted positive d) non-weighted positive

ix) What is the minimum number of spanning tree in a connected graph?

- a) 1 b) 2
c) 3 d) all of these

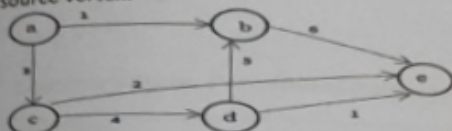
x) Why graph traversal is difficult than tree traversal?

- a) Because tree have root
- b) because tree is binary
- c) Because tree is undefined
- d) all of these

XI) Dijkstra's Algorithm is used to solve _____ problems

- a) All pair shortest path
- b) Single source shortest path
- c) Network flow
- d) Sorting

XII) In the given graph, identify the shortest path having minimum cost to reach vertex E if A is the source vertex.



- a) a-b-e
- b) a-c-e
- c) a-c-d-e
- d) a-c-d-b-e

XIII) A simple digraph with condition that _____ such that it is known as an acyclic graph

- a) it does not contain any loop
- b) it contains a loop
- c) it does not contain any cycle
- d) it contains a cycle

XIV) How many perfect matchings are there in a complete graph of 10 vertices?

- a) 60
- b) 945
- b) 756
- d) 127

XV) The minimum number of edges in a connected cyclic graph on n vertices is

- a) n-1
- b) n
- c) 2n+3
- d) n+1

Class : S.Y.B.Sc. (Computer Science) Sem:IV
 Subject: MTC-242 OPERATION RESEARCH

Academic Year: 2022-23
 Internal Evaluation Record

Roll No.	Seat No.	Name	Internal Marks (out of 15)					Signature
			Assignment submitted	Assignment (15)	Internal Attendance	Int. Test Score (15)	Best of 2 (15)	
SBCS003	3385	ADMANE GAYATRI YASHODHAN	Gayatri	11	Gayatri	6	11	Gayatri
SBCS101	3386	PALAVE ANJALI SIDDHESHWAR	Anjali	12	Anjali	9	12	Anjali
SBCS071	3387	KOLHAPURE ASHISH SHRIDHAR	Ashish	12	Ashish	12	12	Ashish
SBCS070	3388	KEDARI ATHARVA AMAR	Atharva	13	Atharva	13	13	Atharva
SBCS011	3389	BATHE ATHARVA RAVINDRA	Atharva	13	Atharva	13	13	Atharva
SBCS009	3390	BANSOD ADITI BHARAT	Bansod	13	Bansod	13	13	Bansod
SBCS012	3391	BEKE MANAS DHANANJAY	Manas	13	Manas	12	13	Manas
SBCS013	3392	BHAGAT SWARAJ SACHIN	Bhagat	13	Bhagat	13	13	Bhagat
SBCS018	3393	BODHANI SOHAM RAHUL	Soham	13	Soham	9	13	Soham
SBCS022	3394	CHHALLARE YUGANDHARA HARSHAD	Yugandhara	12	Yugandhara	12	12	Yugandhara
SBCS028	3395	DESHPANDE ATHARV MORESHWAR	Atharv	11	Atharv	6	11	Atharv
SBCS030	3396	DEVKATE CHAITRALI ABASAHEB	Devkate	12	Devkate	11	12	Devkate
SBCS031	3397	DHUMAL PRIYRAJ AJIT	Priyraj	11	Priyraj	10	11	Priyraj
SBCS129	3398	DHUME KOMAL DHANANJAY	Komal	12	Komal	12	12	Komal
SBCS032	3399	FALKE KAUSHAL SANTOSH	Kaushal	12	Kaushal	10	12	Kaushal
SBCS034	3400	GANGAPURKAR RIDDHI ASHISH	Riddhi	12	Riddhi	11	12	Riddhi
SBCS036	3401	GAVALI ARYA PRASHANT	Aravali	13	Aravali	13	13	Aravali
SBCS137	3402	GHATE SANSKAR RAMDAS	Sanskar	13	Sanskar	12	13	Sanskar
SBCS037	3403	GHORPADE RAJ YOGESH	Raj	12	Raj	12	12	Raj
SBCS038	3404	GODBOLE PRUTHU RAHUL	Pruthi	12	Pruthi	12	12	Pruthi
SBCS039	3405	GOGAWALE RUTUJA RAJENDRA	Rutuja	13	Rutuja	12	13	Rutuja
SBCS040	3406	GUGALE SHREYA RAJU	Shreya	12	Shreya	12	12	Shreya
SBCS041	3407	GUNDA NITESH GUNDA	Nitesh	12	Nitesh	12	12	Nitesh
SBCS042	3408	GURAV PARTH DATTATRAY	Parth	12	Parth	12	12	Parth
SBCS043	3409	HARER ANISH ARVIND	Anish	12	Anish	12	12	Anish
SBCS045	3410	INGALE SIDDHI RAJESH	Siddhi	12	Siddhi	11	12	Siddhi
SBCS047	3411	JADHAV AJAY KISHOR	Ajay	11	Ajay	8	11	Ajay
SBCS050	3412	JADHAV KARAN ANIL	Karan	12	Karan	11	12	Karan
SBCS055	3413	JANGAM MAKARAND MANOJ	Makarand	12	Makarand	10	12	Makarand
SBCS057	3414	JOGAWADE ADITYA SUJIT	Aditya	11	Aditya	10	11	Aditya
SBCS060	3415	KADU SIDDHANT SANJAY	Siddhant	12	Siddhant	9	12	Siddhant
SBCS062	3416	KALYANKAR SUYASH SUDHEER	Suyash	12	Suyash	12	12	Suyash
SBCS064	3417	KAMTHE ANURAG PURUSHOTTAM	Anurag	12	Anurag	11	12	Anurag
SBCS065	3418	KANDHARE AYUSH HANUMANT	Ayush	12	Ayush	11	12	Ayush
SBCS066	3419	KARALE ARYA KAILAS	Aravali	12	Aravali	11	12	Aravali
SBCS067	3420	KARANDE SUSHANT SANJAY	Sushant	13	Sushant	13	13	Sushant
SBCS068	3421	KASBE YASH RAJESH	Yash	13	Yash	13	13	Yash
SBCS145	3422	VISPUTE KAUSTUBH MOHAN	Kaustubh	12	Kaustubh	11	12	Kaustubh
SBCS072	3423	KUBADE SAHIL VINAYAK	Sahil	12	Sahil	8	12	Sahil
SBCS077	3424	LOKHANDE AKANKSHA RAMCHANDRA	Akanksha	12	Akanksha	12	12	Akanksha
SBCS078	3425	MADANE PRASHANT SOPAN	Prashant	12	Prashant	9	12	Prashant
SBCS079	3426	MALI ADITYA DIPAK	Aditya	12	Aditya	11	12	Aditya
SBCS081	3427	MANDAL BIPIN DEEPAK	Bipin	12	Bipin	10	12	Bipin
SBCS082	3428	MANDHARE PRATIK VIJAY	Pratik	12	Pratik	11	12	Pratik
SBCS084	3429	MARATHE SHRUTIKA VASANT	Shrutika	12	Shrutika	10	12	Shrutika
SBCS085	3430	MORE ADITYA SATISH	Aditya	12	Aditya	12	12	Aditya
SBCS087	3431	MUSALE NISHA EKNATH	Nisha	12	Nisha	7	12	Nisha
SBCS088	3432	NAGARKAR SHREYAS SHRINIWAS	Shreyas	12	Shreyas	7	12	Shreyas
SBCS089	3433	NAIK ISHWARI NANDLAL	Ishwari	12	Ishwari	12	12	Ishwari
SBCS090	3434	NAIR RITIN VIJAY	Ritin	12	Ritin	12	13	Ritin
SBCS093	3435	NIGADE SHWETA GOPAL	Shweta	11	Shweta	8	11	Shweta
SBCS094	3436	NILEE LALIT AMAR	Lalita	12	Lalita	10	12	Lalita
SBCS095	3437	NIRGUN SAKSHI PRATAP	Sakshi	12	Sakshi	9	12	Sakshi
SBCS096	3438	NIVANGUNE SIDDHI RAMDAS	Siddhi	11	Siddhi	9	11	Siddhi
SBCS051	3439	JADHAV OMKAR DEEPAK	Omkar		Omkar			Omkar

SBCS103	3440	PARTE ABHIRAJ GANESH	Parte	12	Parte	12	12	Parte
SBCS104	3441	PATEL JUNAID JALIL	Junalil	12	Junalil	12	12	Junalil
SBCS107	3442	PATIL PRANJAL GIRISH	Pranjal	12	Pranjal	9	12	Pranjal
SBCS108	3443	PATIL SHRAVANI SANTOSH	Shravani	12	Shravani	9	12	Shravani
SBCS130	3444	SNEHAL AMOL PISAL	Snehal	12	Snehal	11	12	Snehal
SBCS113	3445	PURANDARE MAYUR MANOJ	Manoj	12	Manoj	12	12	Manoj
SBCS114	3446	RAJE NIRAJ ANIL	Niraj	13	Niraj	12	13	Niraj
SBCS115	3447	RASKAR NEEL PANDURANG	Neel	12	Neel	12	12	Neel
SBCS080	3448	MALPOTE SAKSHI SANTOSH	Sakshi	13	Sakshi	11	13	Sakshi
SBCS116	3449	SALUNKE VAISHNAVI VITTHAL	Salunke	12	Salunke	12	12	Salunke
SBCS117	3450	SALVE YASH DAULAT	Salve	10	Salve	4	10	Salve
SBCS121	3451	SHAIKH AMAN ABID	Aman	12	Aman	12	12	Aman
SBCS122	3452	SHAIKH ARBAJ SIRAJ	Arbaj	12	Arbaj	11	12	Arbaj
SBCS124	3453	SHENDGE SAGARIKA MARUTI	Shendge	12	Shendge	9	12	Shendge
SBCS126	3454	SHINDE AISHWARYA MAHENDRA	Shinde	12	Shinde	9	12	Shinde
SBCS127	3455	SHINDE MANSEE SHASHIKANT	Shinde	12	Shinde	10	12	Shinde
SBCS128	3456	SHINDE SAMEER SAKHARAM	Shinde	12	Shinde	12	12	Shinde
SBCS110	3457	PILAWARE SHRUTI BALASAHEB	Shruti	12	Shruti	11	12	Shruti
SBCS123	3458	SHELAR SOHAN RAJENDRA	Sohan	12	Sohan	11	12	Sohan
SBCS131	3459	SOMAN YUVRAJ RAMCHANDRA	Yuvraj	9	Yuvraj	AB	9	Yuvraj
SBCS132	3460	SONAWANE SHREYA ANIL	Shreya	13	Shreya	9	13	Shreya
SBCS133	3461	SUKHDEVE SHREYASH ARVIND	Shreyash	13	Shreyash	13	13	Shreyash
SBCS134	3462	SULAKHE PRATHMESH RAVINDRA	Sulakhe	12	Sulakhe	8	12	Sulakhe
SBCS023	3463	CHOUDHARI SUMIT SANJAY	Sumit	12	Sumit	12	12	Sumit
SBCS135	3464	SUPEKAR AKSHADA KALIDAS	Akshada	13	Akshada	13	13	Akshada
SBCS111	3465	PISAL SUYASH SUBHASH	Suyash	12	Suyash	10	12	Suyash
SBCS002	3466	ADAGALE SWAPNIL RAVINDRA	Swapnil	10	Swapnil	10	10	Swapnil
SBCS138	3467	TAKAWALE SAKSHI SANJAY	Sakshi	13	Sakshi	13	13	Sakshi
SBCS139	3468	TAWDE AKANKSHA PANDURANG	Tawde	12	Tawde	11	12	Tawde
SBCS140	3469	TEKE PARTH PRASHANT	Part	13	Part	13	13	Part
SBCS141	3470	THORAT SAKSHI KIRAN	Sakshi	12	Sakshi	9	12	Sakshi
SBCS142	3471	THORAT SRUSHTI SUNIL	Srushti	12	Srushti	12	12	Srushti
SBCS020	3472	BRAMHE UTKARSH PRAKASH	Utkarsh	12	Utkarsh	12	12	Utkarsh
SBCS021	3473	CHAVAN VAISHNAVI JAGANNATH	Chavan	12	Chavan	12	12	Chavan
SBCS143	3474	VANARASE AMOD AVINASH	Amod	12	Amod	9	12	Amod
SBCS144	3475	VAWAL SIDDHI SACHIN	Siddhi	12	Siddhi	11	12	Siddhi
SBCS149	3476	YADAV ATHARVA VIJAY	Atharva	12	Atharva	12	12	Atharva
SBCS004	3477	AINAPURE ARYA HEMANT	Arya	11	Arya	5	11	Arya
SBCS005	3478	ANDE RUCHITA AVINASH	Ruchita	13	Ruchita	13	13	Ruchita
SBCS044	3479	HUNDA ANILNATH TEJANATH	Anilnath	12	Anilnath	11	12	Anilnath
SBCS063	3480	KAMBLE ATHARVA ANIL	Atharva	14	Atharva	12	14	Atharva
SBCS017	3481	BHOSALE ATHARVA BHARAT	Atharva	13	Atharva	13	13	Atharva
SBCS007	3482	BADADE NEHA SUNIL	Badade	13	Badade	13	13	Badade
SBCS008	3483	BANDAL SIDDHESH SANTOSH	Siddhesh	13	Siddhesh	13	13	Siddhesh
SBCS010	3484	BARGIR ATHARV SUNIL	Atharv	13	Atharv	13	13	Atharv
SBCS006	3485	BARVE PRACHI ANAND	Prachi	14	Prachi	14	14	Prachi
SBCS014	3486	BHAGWAT RUTUJA RAMKISAN	Rutuja	12	Rutuja	12	12	Rutuja
SBCS015	3487	BHIVARE MOHIT HANUMANT	Mohit	13	Mohit	13	13	Mohit
SBCS016	3488	BHORADE VAISHNAVI VITTHAL	Vaishnavi	13	Vaishnavi	13	13	Vaishnavi
SBCS019	3489	BORADE YASH NILESH	Yash	12	Yash	12	12	Yash
SBCS025	3490	DANGI MAHENDRA MAHAVIR	Mahendra	13	Mahendra	12	13	Mahendra
SBCS026	3491	DANVE PRANITA ANIL	Pranita	13	Pranita	11	12	Pranita
SBCS027	3492	DESHMUKH HARSHADA VIDYADHAR	Harshada	13	Harshada	9	13	Harshada
SBCS029	3493	DESHPANDE MEGHANA UMESH	Meghna	12	Meghna	10	12	Meghna
SBCS033	3494	GAIKWAD DARSHANA ANIL	Darshana	12	Darshana	12	12	Darshana
SBCS035	3495	GAVADE NIKITA SURESH	Nikita	13	Nikita	13	13	Nikita
SBCS046	3496	JADHAV AARYA AVINASH	Aarya	12	Aarya	11	12	Aarya
SBCS048	3497	JADHAV AMAR VITTHAL	Amar	12	Amar	11	12	Amar
SBCS049	3498	JADHAV ANIKET TATYA	Aniket	12	Aniket	10	12	Aniket
SBCS053	3499	JADHAV VISHAL VIJAY	Vishal	12	Vishal	11	12	Vishal
SBCS054	3500	JAGDALE DHIRAJ VIJAY	Dhiraj	12	Dhiraj	12	12	Dhiraj
SBCS056	3501	JEDHE ATHARVA SHANKAR	A.S. Jedhe	12	A.S. Jedhe	10	12	A.S. Jedhe
SBCS058	3502	JOSHI SANJANA SANDEEP	Sanjana	14	Sanjana	13	14	Sanjana
SBCS059	3503	KADAM KARAN KAILAS	Kadam	12	Kadam	11	12	Kadam
SBCS061	3504	KAGADE DHAIRYASHIL KALYANRAO	Dhairya	12	Dhairya	12	12	Dhairya
SBCS069	3505	KATARE DISHA DINESH	Disha	13	Disha	13	13	Disha
SBCS148	3506	WAGHRESHA KRISH DEVENDRA	Krish	13	Krish	12	13	Krish

SBCS1073	3507	KUDAL GAYATRI ASHOK	G. Gayatri	12	G. Gayatri	12	12	G. Gayatri
SBCS1074	3508	KUKKAR KHUSHI RAVINDRA	K. Khushi	13	K. Khushi	12	13	K. Khushi
SBCS1075	3509	KULKARNI SHUBHANKAR ASHISH	K. Ashish	11	K. Ashish	11	11	K. Ashish
SBCS1083	3510	MANDHARE YASH POPAT	M. Yash	12	M. Yash	11	12	M. Yash
SBCS1086	3511	MORE DEVYANI SANJAY	M. Devyani	13	M. Devyani	13	13	M. Devyani
SBCS1091	3512	NANGUDE PIYUSHA PRAVIN	N. Piyusha	12	N. Piyusha	12	12	N. Piyusha
SBCS1092	3513	NIGADE PAVAN SANDIP	N. Pavan	12	N. Pavan	11	12	N. Pavan
SBCS1097	3514	PACHPUTE RUTUJA SANTOSH	P. Rutuja	12	P. Rutuja	11	12	P. Rutuja
SBCS1098	3515	PADITKAR PRATIK CHANDRAHAS	P. Pratik	13	P. Pratik	11	13	P. Pratik
SBCS1099	3516	PADRAT SAYALI SUNIL	P. Sayali	12	P. Sayali	12	12	P. Sayali
SBCS1100	3517	PAIGUDE AASHISH RAHUL	P. Aashish	12	P. Aashish	11	12	P. Aashish
SBCS1102	3518	PANDE AKANKSHA AVINASH	P. Akanksha	13	P. Akanksha	12	13	P. Akanksha
SBCS1105	3519	PATIL MOHINI NITIN	P. Mohini	13	P. Mohini	11	13	P. Mohini
SBCS1106	3520	PATIL PRAJYOT PRAVIN	P. Prajyot	12	P. Prajyot	10	12	P. Prajyot
SBCS1001	3521	PEERJADE MOHAMMAD SAAD ABDULRAUF	P. Saad	12	P. Saad	10	12	P. Saad
SBCS1109	3522	PETHSANGAVIKAR ANISHA BALASAHEB	P. Anisha	13	P. Anisha	9	13	P. Anisha
SBCS1112	3523	PORE TANVI SAMEER	P. Tanvi	13	P. Tanvi	11	13	P. Tanvi
SBCS1076	3524	KUSEKAR SAKSHI VUJAY	K. Sakshi	13	K. Sakshi	11	13	K. Sakshi
SBCS147	3525	WAGHMARE SALOMI VISHWAS	W. Salomi	12	W. Salomi	11	12	W. Salomi
SBCS136	3526	SUTAR SANIL KISAN	S. Sanil	12	S. Sanil	12	12	S. Sanil
SBCS118	3527	SANKLECHA VIVA PRAVIN	S. Viva	13	S. Viva	13	13	S. Viva
SBCS119	3528	SARPALE SIDDHI SANTOSH	S. Siddhi	14	S. Siddhi	14	14	S. Siddhi
SBCS120	3529	SASTE AJINKYA MANGESH	S. Ajinkya	13	S. Ajinkya	13	13	S. Ajinkya
SBCS125	3530	SHILIMKAR ROHAN RAJAN	S. Rohan	12	S. Rohan	9	12	S. Rohan
SBCS1024	3531	DABKE SWARAJ SAMEER	D. Swaraj	12	D. Swaraj	10	12	D. Swaraj
SBCS1052	3532	JADHAV TANMAY SUBHASH	J. Tanmay	12	J. Tanmay	10	12	J. Tanmay
SBCS146	3533	WAGHMARE EKTA DEEPAK	W. Ekta	12	W. Ekta	12	12	W. Ekta
SBCS150	3534	YADAV YASH SANTAJI	Y. Yash	12	Y. Yash	12	12	Y. Yash
SBCS151	3535	YANDE SAMRUDDHI SANDIP	Y. Samruddhi	13	Y. Samruddhi	13	13	Y. Samruddhi
SBCS152	3536	YELBHAR SHRAVANI ANIL	Y. Shravani	14	Y. Shravani	13	14	Y. Shravani
SBCS153	3537	ZAMBRE JANHAVI PRASHANT	Z. Janhavi	12	Z. Janhavi	10	12	Z. Janhavi
Name of Subject Teacher				Signature Of Subject Teacher				

[5902]-14

F. Y. B.Sc. (Computer Science)

MATHEMATICS

MTC-112 : Discrete Mathematics

(2019 Pattern) (Semester - I) (Paper-II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:-

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of single memory, non programmable scientific calculator is allowed.

Q1) Attempt any five of the following.

[10]

- a) In how many ways can the letters in the word 'MIRROR' be arranged?
- b) Find the terms a_3 and a_5 of the sequence (a_n) if the recurrence relation for (a_n) is $a_n = a_{n-1} + a_{n-2}$, $n \geq 3$ with initial condition $a_1 = 1$, $a_2 = 1$.
- c) Draw the digraph for the relation $R = \{(1, 2), (2, 2), (2, 1), (3, 4), (4, 3)\}$ on the set $X = \{1, 2, 3, 4\}$.
- d) State the converse and contrapositive of the following implication.
'If it snows today, I will ski tomorrow'.
- e) Is the following Hasse diagram a lattice? Justify.



- f) State pigeonhole principle.
- g) Translate the following into symbolic form
 - i) There exists a natural number x such that " $x^2 + 1 = 0$ ".
 - ii) All rationals are real numbers.

P.T.O.

Q2) Attempt any three of the following.

[15]

- a) Show that in a Boolean algebra every element x has unique complement \bar{x} such that.
 $x \vee \bar{x} = 1$ and $x \wedge \bar{x} = 0$.
- b) How many 4 digit numbers whose digits are taken from the set $S = \{1, 2, 3, 4, 5\}$ (without repetition) are there? How many of them are divisible by 5?
- c) Find disjunctive normal form for the function $F(x, y, z) = (x \vee y) \wedge \bar{z}$
- d) Solve the recurrence relation given below. $a_n - a_{n-1} - 2a_{n-2} = 0$.
- e) Verify whether the following statements are tautology, contradiction or neither. $(p \wedge q) \wedge \neg p$.

Q3) Attempt any one of the following.

[10]

- a) How many integers between 1 and 1000 are divisible by
- 2 or 3 or 5
 - 2 and 3 but not 5.
- b) Find transitive closure of relation $R = \{(a, b), (b, a), (b, c), (c, d)\}$ Also draw digraph of transitive closure of R .



P.V.G's College of Science, Pune 411009
Teaching Plan

for First Half of Academic Year : 2022-23

Class : S.Y.M.Sc (CA)
Semester : III

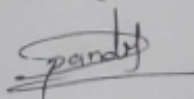
Subject Code : CA-CCTP-7

Subject Title : Mobile Application Development

Using
Android

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	27/9/22 - 30/9/22	Syllabus discussion & Introduction of chapter 1
2	3/10/22 - 7/10/22	Chapter 1 Fundamentals of Android
3	10/10/22 - 14/10/22	Chapter-2 Android UI Design
4	17/10/22 - 21/10/22	Chapter-2 and chapter-3 Android Thread and Notification
5	31/10/22 - 4/11/22	Chapter 3 and chapter-4 Advanced Android programming.
6	7/11/22 - 11/11/22	Chapter - 4
7	14/11/22 - 18/11/22	Chapter-5 PhoneGap programming
8	21/11/22 - 25/11/22	Chapter-5
9	28/11/22 - 2/12/22	Chapter-6 iOS Fundamentals
10	5/12/22 - 9/12/22	Chapter-6
11	12/12/22 - 16/12/22	Chapter-6 & Revision

Name of the subject Teacher : Supriya Pandit

Signature of the subject Teacher : 

P.V.G's College of Science, Pune 411009
Teaching Plan

for First Half of Academic Year : 2022-23

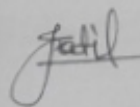
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Class : M.Sc (CA)
Semester : III

Subject Code : CA-CCTP-8
Subject Title : IOT

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	26/9/22-30/9/22	1 Fundamentals of IOT Basic concept of IOT
2	3/10/22-7/10/22	2 Communication technologies, wireless communication
3	10/10/22-14/10/22	HTTP, MQTT, CoAP, XMPP.
4	17/10/22-21/10/22	2 Microcontroller Fun & Prog. Sys. on chip, microcontroller, programming & Interfacing.
5	7/11/22-11/11/22	Anatomy of an Arduino Board.
6	14/11/22-18/11/22	3 Intro to cloud computing. cloud based architecture.
7	21/11/22-25/11/22	Introduction to cloud based IOT Platforms like IBM
8	28/11/22-2/12/22	4 sensor Fundamentals. sensor fundamentals, Edu of sensors.
9	5/12/22-9/12/22	4 Temp. Humidity, Lux. 5 Arduino Interface. Simple Ethernet server
10	12/12/22-16/12/22	Connect Arduino with the WiFi Security Issues at
11		dist. layers.

Name of the subject Teacher : Jyoti Patil

Signature of the subject Teacher :



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Teaching Plan

for First Half of Academic Year : 2022-23

Class : B.Y. MSC(CCA)
Semester : III

Subject Code : CA-CC TP9
Subject Title : Artificial Intelligence

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	26/9/22 - 30/9/22	1. Introduction to Artificial Intelligence
2	3/10/22 - 7/10/22	2. Problems, Problems Space & Search
3	10/10/22 - 14/10/22	3. Heuristic Search Technique
4	17/10/22 - 21/10/22	4. Knowledge Representations
5	7/11/22 - 11/11/22	4. Knowledge Representation
6	14/11/22 - 18/11/22	5. Slot & Filler Structures
7	21/11/22 - 25/11/22	5. Slot & Filler Structure
8	28/11/22 - 2/12/22	6. Game Playing
9	5/12/22 - 9/12/22	7. Statistical Reasoning
10	12/12/22 - 16/12/22	8. Learning
11		

Archana S. Ghiware
Name of the subject Teacher :

Signature of the subject Teacher : AGhiware

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Teaching Plan

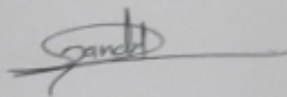
for First Half of Academic Year : 2022-23

Class : S.Y.M.Sc(CA)
Semester : III

Subject Code : CA-CCPP-3
Subject Title : Android Laboratory

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	10/10/22 - 14/10/22	Assignment - I
2	17/10/22 - 21/10/22	Assignment - I
3	31/10/22 - 4/11/22	Assignment - II
4	7/11/22 - 11/11/22	Assignment - II
5	14/11/22 - 18/11/22	Assignment - III
6	21/11/22 - 25/11/22	Assignment - III
7	28/11/22 - 2/12/22	Assignment - IV
8	5/12/22 - 9/12/22	- II -
9	12/12/22 - 16/12/22	Assignment - V
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Name of the subject Teacher : Supriya Pandit

Signature of the subject Teacher : 

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Teaching Plan

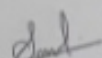
for First Half of Academic Year : 2022-23

Class : M.Sc - CA - II
Semester : III

Subject Code : CA-CBOTP-3A
Subject Title : Python programming

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	28/9/22 - 6/10/22	1. Introduction to Python Scripting
2	7/10/22 - 17/10/22	2. Python Strings
3	18/10/22 - 22/10/22	3. Python tuples, sets, Dictionary
4	31/10/22 - 7/11/22	4. Functions
5	8/11/22 - 16/11/22	5. Files & Directories
6	17/11/22 - 29/11/22	6. Python classes & objects
7	30/11/22 - 15/12/22	7. Python Exceptions
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Name of the subject Teacher : Prof Sonali Mutha

Signature of the subject Teacher : 

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Teaching Plan

for First Half of Academic Year : 2022-23


Class : M.Sc. CA-II
Semester : III

Subject Code : CA.CBOPP-3A

Subject Title : Python programming Laboratory

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	10/10/22 - 16/10/22	Ass 1 to Ass 4
2	17/10/22 - 23/10/22	Ass 5 to Ass 8
3	31/10/22 - 6/11/22	Ass 9 to Ass 12
4	7/11/22 - 13/11/22	Ass 13 to Ass 16
5	14/11/22 - 20/11/22	Ass 17 to Ass 20
6	21/11/22 - 27/11/22	Ass 21 to Ass 24
7	28/11/22 - 4/12/22	Ass 25 to Ass 28
8	5/12/22 - 11/12/22	Ass 29 to Ass 31
9		
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Name of the subject Teacher : Prof Sonali Mutha

Signature of the subject Teacher : 

P.V.G's College of Science, Pune 411009
Teaching Plan

for First Half of Academic Year : 2022-23

Class : F.Y.MSC(CA)
Semester : I

Subject Code : CA-CCTP-1
Subject Title : Web Technology

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	10/10/22 - 15/10/22	ch.1 Introduction to web Technology (4)
2	17/10/22 - 21/10/22	HTML / HTML 5 client/server image map.
3	11/11/22 - 4/11/22	form, table, form control,
4	7/11/22 - 11/11/22	ch.3 CSS, Intro. Bootstrap Types, Box model. (6)
5	14/11/22 - 18/11/22	ch.4. Javascript. (10) Types of script, variable operator, control struc.
6	21/11/22 - 25/11/22	ch.4. Javascript. Event handling, DOM etc.
7	28/11/22 - 2/12/22	ch.5 XML (4)
8	5/12/22 - 9/12/22	ch.6 Introduction to PHP.
9	12/12/22 - 16/12/22	ch.7. PHP function.
10	19/12/22 - 23/12/22	ch.8 PHP array
11	26/12/22 - 30/12/22	ch.8.&9 PHP array & Intro. to framework.

Name of the subject Teacher : Malpani S.R.

Signature of the subject Teacher :

P.V.G's College of Science, Pune 411009
Teaching Plan

for First Half of Academic Year : 2022-23

Class : FYMSCCCA
Semester : I

Subject Code : CA-CCTP-1
Subject Title : Web Technology

Sr. No.	Week (start date - end date)	Chapter No. & Name
1	10/10/22 - 15/10/22	ch.1 Introduction to web Technology (4)
2	17/10/22 - 21/10/22	HTML / HTML5 client/server image map.
3	11/11/22 - 4/11/22	form, table, form control,
4	7/11/22 - 11/11/22	ch.3 CSS, Intro. Bootstrap Types, Box model. (6)
5	14/11/22 - 18/11/22	ch.4. Javascript. (10) Types of script, variable operator, control struc.
6	21/11/22 - 25/11/22	ch.4. Javascript. Event handling, DOM etc.
7	28/11/22 - 2/12/22	ch.5 XML (4)
8	5/12/22 - 9/12/22	ch.6 Introduction to PHP.
9	12/12/22 - 16/12/22	ch.7. PHP function.
10	19/12/22 - 23/12/22	ch.8 PHP array
11	26/12/22 - 30/12/22	ch.8.&9 PHP array & Intro. to framework.

Name of the subject Teacher : Malpani S.R.

Signature of the subject Teacher :