Telephone No. 2419677/2419361
Fax: 0821-2419363/2419301

e-mail : registrar@uni-mysore.ac.in
www.uni-mysore.ac.in

UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2021-22

Dated: 12.04.2024

Notification

Sub:- Approval of the modification in the Computer Applications (CB) Syllabus.

Ref:-1. Decision of Board of Studies in Computer Science (CB) meeting held on 10.04.2024.

2. Approval of the hon'ble Vice-chancellor dated .

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The Board of Studies in Computer Science (CB) which met on 10.04.2024 has resolved to recommend the modification in the 3rd year BCA program Computer Applications Syllabus (Practical & Project Work).

Pending approval of the Faculty of Science & Technology and Academic Council meetings the above said modified Syllabus of Computer Applications (Practical & Project Work) is hereby notified.

The modified Computer Applications Syllabus (Practical & Project Work) for BCA program (NEP) may be downloaded from the University website i.e., www.uni-mysore.ac.in.

Registrar 12/4/2024

Registrar
University of Mysore
Mysore

To;

1. The Registrar (Evaluation), University of Mysore, Mysuru.
2. The Chairman, BOS/DOS in Computer Science, Manasagangothri, Mysore.
3. The Director, ICD, Dos in Computer Science, Manasagangothri, Mysore- with a request to publish in university website.
4. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
5. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
6. Office Copy.

University of Mysore

Syllabus and Framework for Bachelor of Computer Applications (V& VI Semester)

Curriculum for BCA

Program: B.C.A **Subject: Computer Application**

Semester	Course No.	Theory/ Practical	Credits (LTP)	Paper Title	Marks	
					SEE	CIE
V	DSC-C21	Theory	4(4-0-0)	Design & Analysisof Algorithms	60	40
	DSC-C22	Practical	2(0-0-2)	Design & Analysisof Algorithms Lab	25	25
	DSC-C23	Theory	4(4-0-0)	Statistical Computing and R Programming	60	40
	DSC-C24	Practical	2(0-0-2)	R Programming Lab	25	25
	DSC-C25	Theory	4(4-0-0)	Software Engineering	60	40
	DSE-E1	Theory	3(3-0-0)	A. Cloud Computing B. Business Intelligence	60	40
	Voc-1	Theory	3(3-0-0)	Digital Marketing	60	40
	SEC-4	Theory/Practical	3(3-0-0)	Cyber Security	50	50
Total Credits			**25**			
VI	DSC-C26	Theory	4(4-0-0)	Artificial Intelligence and Applications	60	40
	DSC-C27	Practical	2(0-0-2)	Artificial Intelligence and Applications Lab	25	25
	DSC-C28	Theory	4(4-0-0)	PHP and MySQL	60	40
	DSC-C29	Practical	2(0-0-2)	PHP and MySQL Lab	25	25
	DSC-C30	Project	4 (0-0-4)	Project Work	60	40
	DSE-E2	Theory	3(3-0-0)	A. Fundamentals of Data Science B. Mobile Application Development	60	40
	Voc-2	Theory	3(3-0-0)	Web Content Management System	60	40
			2	Internship		C1-50 C2-50
Total Credits			**24**			

Program Name	**BCA**	Semester	**V**
Course Title	**Design and Analysis of Algorithm (Theory)**		
Course Code:	**DSC-C21**	No. of Credits	**04**
Contact hours	**52 Hours**	Duration of SEA/Exam	**2 ½ hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:
CO1. Understand the fundamental concepts of algorithms and their complexity, including time and space complexity, worst-case and average-case analysis, and Big-O notation. BL (L1, L2)
CO2. Design algorithms for solving various types of problems, such as Sorting, Searching, Graph traversal, Decrease-and-Conquer, Divide-and-Conquer and Greedy Techniques. BL (L1, L2, L3)
CO3. Analyze and compare the time and space complexity of algorithms with other algorithmic techniques. BL (L1, L2,L3,L4)
CO4. Evaluate the performance of Sorting, Searching, Graph traversal, Decrease-and-Conquer, Divide-and-Conquer and Greedy Techniques using empirical testing and benchmarking, and identify their limitations and potential improvements. BL (L1, L2, L3, L4)
CO5. Apply various algorithm design to real-world problems and evaluate their effectiveness and efficiency in solving them. BL (L1, L2, L3)
Note: Blooms Level(BL): L1=Remember, L2=Understand, L3=Apply, L4=Analyze, L5= Evaluate, L6= Create

Contents	**52 Hrs**
Introduction: What is an Algorithm? Fundamentals of Algorithmic problem solving, Fundamentals of the Analysis of Algorithm Efficiency, Analysis Framework, Measuring the input size, Units for measuring Running time, Orders of Growth, Worst-case, Best-case and Average-case efficiencies.	10
Asymptotic Notations and Basic Efficiency classes, Informal Introduction, O-notation, Ω-notation, θ-notation, mathematical analysis of non-recursive algorithms, mathematical analysis of recursive algorithms.	10
Brute Force & Exhaustive Search: Introduction to Brute Force approach, Selection Sort and Bubble Sort, Sequential search, Exhaustive Search- Travelling Salesman Problem and Knapsack Problem, Depth First Search, Breadth First Search	11
Decrease-and-Conquer: Introduction, Insertion Sort, Topological Sorting **Divide-and-Conquer:** Introduction, Merge Sort, Quick Sort, Binary Search, Binary Tree traversals and related properties.	11
Greedy Technique: Introduction, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Lower-Bound Arguments, Decision Trees, P Problems, NP Problems, NP-Complete Problems, Challenges of Numerical Algorithms.	10

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**
Formative Assessment as per guidelines.	

Program Name	**B.C.A**	Semester	**V**
Course Title	**Design and Analysis of Algorithms Laboratory (Practical)**	Practical Credits	**02**
Course Code	DSC-C22	Contact Hours	**4 Hours/wk**
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**

Practical Content

1. Write a program to sort a list of N elements using Selection Sort Technique.
2. Write a program to perform Travelling Salesman Problem
3. Write program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
4. Write a program to perform Knapsack Problem using Greedy Solution
5. Write program to implement the DFS and BFS algorithm for a graph.
6. Write a program to find minimum and maximum value in an array using divide and conquer.
7. Write a test program to implement Divide and Conquer Strategy. Eg: Quick sort algorithm for sorting list of integers in ascending order.
8. Write a program to implement Merge sort algorithm for sorting a list of integers inascending order.
9. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort.
10. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort.
11. Write C program that accepts the vertices and edges for a graph and stores it as an adjacency matrix.
12. Implement function to print In-Degree, Out-Degree and to display that adjacency matrix.
13. Write program to implement backtracking algorithm for solving problems like N queens .
14. Write a program to implement the backtracking algorithm for the sum of subsets problem
15. Write program to implement greedy algorithm for job sequencing with deadlines.
16. Write program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
17. Write a program that implements Prim's algorithm to generate minimum cost spanning Tree.
18. Write a program that implements Kruskal's algorithm to generate minimum cost spanning tree.

Pedagogy: Demonstration, Hands-on, Simulation

References	
1	Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009, Pearson.
2	Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
3	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
4	Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)
5	Weblinks and Video Lectures (e-Resources): http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43 .html https://nptel.ac.in/courses/106/101/106101060/ http://elearning.vtu.ac.in/econtent/courses/video/FEP/ADA.h tml http://cse01-iiith.vlabs.ac.in/ http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms

Evaluation Scheme for Lab Examination

Assessment Criteria Marks	Marks
Writing the Program	10
Execution and Formatting	10
Viva Voce	2
Practical Record	3
Total	**25**

Program Name	**BCA**	Semester	**V**
Course Title	**Statistical Computing & R Programming (Theory)**		
Course Code:	DSC-C23	No. of Credits	**04**
Contact hours	**52 Hours**	Duration of SEA/Exam	**2 ½ hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1. Explore fundamentals of statistical analysis in R environment.

CO2. Describe key terminologies, concepts and techniques employed in Statistical Analysis.

CO3. Define Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.

CO4. Conduct and interpret a variety of Hypothesis Tests to aid Decision Making.

CO5. Understand, Analyse, and Interpret Correlation Probability and Regression to analyse the underlying relationships between different variables.

Contents	**52 Hrs**
Introduction of the language, numeric, arithmetic, assignment, and vectors, Matrices and Arrays, Non-numeric Values, Lists and Data Frames, Special Values, Classes, and Coercion, Basic Plotting.	10
Reading and writing files, Programming, Calling Functions, Conditions and Loops: stand-alone statement with illustrations in exercise 10.1,stacking statements, coding loops, Writing Functions, Exceptions, Timings, and Visibility.	10
Statistics And Probability, basic data visualisation, probability, common probability distributions: common probability mass functions, bernoulli, binomial, poisson distributions, common probability density functions, uniform, normal, student's t-distribution.	11
Statistical testing and modelling, sampling distributions, hypothesis testing, components of hypothesis test, testing means, testing proportions, testing categorical variables, errors and power, Analysis of variance.	10
Simple linear regression, multiple linear regression, linear model selection and diagnostics. Advanced graphics: plot customization, plotting regions and margins, point and click coordinate interaction, customizing traditional R plots, specialized text and label notation. Defining colors and plotting in higher dimensions, representing and using color, 3D scatter plots.	11

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**
Formative Assessment as per guidelines.	

References	
1	Tilman M. Davies, "The book of R: A first course in programming and ststistics", San Francisco, 2016.
2	Vishwas R. Pawgi, "Statistical computing using R software", Nirali prakashan publisher, e1 edition, 2022.
3	https://www.youtube.com/watch?v=KlsYCECWEWE https://www.geeksforgeeks.org/r-tutorial/ https://www.tutorialspoint.com/r/index.htm

Program Name	**B.C.A**	Semester	**V**
Course Title	**R Programming Lab**		
Course Code:	DSC-C24	No. of Credits	**02**
Contact hours	**04 Hours per week**		
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Overview

The following program problematic comprises of R programming basics and application of several Statistical Techniques using it. The module aims to provide exposure in terms of Statistical Analysis, Hypothesis Testing, Regression and Correlation using R programming language.

Learning Objectives

The objective of this Laboratory to make students exercise the fundamentals of statistical analysis in R environment. They would be able to analysis data for the purpose of exploration using Descriptive and Inferential Statistics. Students will understand Probability and Sampling Distributions and learn the creative application of Linear Regression in multivariate context for predictive purpose.

Course Outcomes:

- Install, Code and Use R Programming Language in R Studio IDE to perform basic tasks on Vectors, Matrices and Data frames. Explore fundamentals of statistical analysis in R environment.
- Describe key terminologies, concepts and techniques employed in Statistical Analysis.
- Define Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.
- Conduct and interpret a variety of Hypothesis Tests to aid Decision Making.
- Understand, Analyse, and Interpret Correlation Probability and Regression to analyse the underlying relationships between different variables.

1. Write a R program for different types of data structures in R.
2. Write a R program that include variables, constants, data types.
3. Write a R program that include different operators, control structures, default values for arguments, returning complex objects.
4. Write a R program for quick sort implementation, binary search tree.
5. Write a R program for calculating cumulative sums, and products minima maxima and calculus.
6. Write a R program for finding stationary distribution of markanov chains.
7. Write a R program that include linear algebra operations on vectors and matrices.
8. Write a R program for any visual representation of an object with creating graphs using graphic functions: Plot(),Hist(),Linechart(),Pie(),Boxplot(),Scatterplots().
9. Write a R program for with any dataset containing data frame objects, indexing and subsetting data frames, and employ manipulating and analyzing data.
10. Write a program to create an any application of Linear Regression in multivariate context for predictive purpose.

Evaluation Scheme for Lab Examination

Assessment Criteria Marks	Marks
Writing the Program	10
Execution and Formatting	10
Viva Voce	2
Practical Record	3
Total	**25**

Program Name	**B.C.A**	Semester	**V**
Course Title	**Software Engineering (Theory)**		
Course Code:	DSC-C25	No. of Credits	**04**
Contact hours	**52 Hours**	Duration of SEA/Exam	**2 ½ hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.
CO2	An ability to work in one or more significant application domains.
CO3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.
CO4	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.
CO5	Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Contents	**52 Hrs**
OVERVIEW: Introduction; Software engineering ethics; Software process models; Process activities; Coping with change; Agile software development: Agile methods; Plan-driven and agile development.	10
REQUIREMENTS ENGINEERING: Functional and non-functional requirements; Software requirements document; Requirement's specification; Requirements engineering processes; Requirement's elicitation and analysis; Requirement's validation; Requirementsmanagement.	10
SYSTEM MODELING: Context models; Interaction models- Use case modeling, Sequence diagrams; Structural models- Class diagrams, Generalization, Aggregation; Behavioral models- Data-driven modeling, Event-driven modeling; Model-driven engineering.	10
ARCHITECTURAL DESIGN: Architectural design decisions; Architectural views; Architectural patterns- Layered architecture, Repository architecture, Client–server architecture Pipe and filter architecture. **DESIGN AND IMPLEMENTATION**: Object-oriented design using the UML- System context and interactions, Architectural design, Object class identification, Design models, Interface specification; Design patterns; Implementation issues.	12
SOFTWARE TESTING: Development testing- Unit testing, Choosing unit test cases, Component testing, System testing. Test-driven development; Release testing; User testing- Alpha, Beta, Acceptance testing.	10

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**
Formative Assessment as per guidelines.	

Text Books:	
1	Ian Somerville, "Software Engineering" 8th Edition, Pearson Education, 2009.
References Books:	
1	Waman S Jawadekar, "Software Engineering Principles and Practice", Tata McGrawHill, 2004.
2	Roger S. Pressman, "A Practitioners Approach",7th Edition, McGraw-Hill, 2007.
3	P Jalote, "An Integrated Approach to software Engineering", Narosa Publication.

Program Name	**B.C.A**	Semester	**V**
Course Title	**Cloud Computing (Theory)**		
Course Code:	**DSE-E1**	No. of Credits	**03**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 ½ hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Explain the core concepts of the cloud computing paradigm such as how and why this paradigm shift came about, the characteristics, advantages and challenges brought aboutby the various models and services in cloud computing.
CO2	Apply the fundamental concepts in data center to understand the trade-offs in power, efficiency and cost.
CO3	Identify resource management fundamentals like resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO4	Analyze various cloud programming models and apply them to solve problems on the cloud.

Contents	**42 Hrs**
Introduction: Different Computing Paradigms- Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing etc., Comparison of various Computing Technologies; Cloud Computing Basics- What is Cloud Computing? History, Characteristic Features, Advantages and Disadvantages, and Applications of CloudComputing; Trends in Cloud Computing; Leading Cloud Platform Service Providers.	**8**
Cloud Architecture: Cloud Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Comparison of different Service Models; Cloud Deployment Models- Public Cloud; Private Cloud, Hybrid Cloud, Community Cloud; Cloud Computing Architecture- Layered Architecture of Cloud. Virtualization- Definition, Features of Virtualization; Types of Virtualizations- Hardware Virtualization, Server Virtualization, Application Virtualization, Storage Virtualization, Operating System Virtualization; Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples- Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V.	**10**
Cloud Application Programming and the Aneka Platform: Aneka Cloud Application Platform- Framework Overview, Anatomy of the Aneka Container; Building Aneka Clouds (Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode); Cloud Programming and Management- Aneka SDK (Application Model and Service Model); Management Tools (Infrastructure, Platform and Application management).	**8**
Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services, Additional Services; Google AppEngine- Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations; Microsoft Azure- Azure Core Concepts (Compute, Storage, Core Infrastructure and Other Services), SQL Azure, Windows Azure Platform Appliance.	**8**
Cloud Applications: Scientific Applications- Healthcare (ECG Analysis in the Cloud)	**8**

Biology (Protein Structure Prediction and Gene Expression Data Analysis for Cancer Diagnosis), Geoscience (Satellite Image Processing); Business and Consumer Applications- CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.	

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**
Formative Assessment as per guidelines.	

Text Books:	
1	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering Cloud Computing-Foundations and Applications Programming", Elsevier, 2013
2	Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010
3	K Chandrashekaran: "Essentials of Cloud Computing", CRC Press, 2015
4	Derrick Rountree, Ileana Castrillo: "The Basics of Cloud Computing", Elsevier, 2014

Program Name	**BCA**	Semester	**V**
Course Title	**Business Intelligence (Theory)**		
Course Code:	**DSE-E1**	No. of Credits	**03**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 ½ hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Describe the Decision Support systems and Business Intelligence framework.
CO2	Explore knowledge management, explain its activities, approaches, and its implementation.
CO3	Describe business intelligence, analytics, and decision support systems

Contents	**42 Hrs**
Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems, A Framework for Business Intelligence, Business Analytics Overview, Brief Introduction to Big Data Analytics	**8**
Introduction and Definitions, Phases of the Decision, Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems Capabilities, Decision Support Systems Classification, Decision Support Systems Components.	**8**
Basic Concepts of Neural Networks, Developing Neural Network-Based Systems, Illuminating the Black Box of ANN with Sensitivity, Support Vector Machines, A Process Based Approach to the Use of SVM, Nearest Neighbor Method for Prediction, Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis, Speech Analytics.	**10**
Decision Support Systems modeling, Structure of mathematical models for decision support, Certainty, Uncertainty, and Risk, Decision modeling with spreadsheets, Mathematical programming optimization, Decision Analysis with Decision Tables and Decision Trees, Multi-Criteria Decision Making With Pairwise Comparisons.	**8**
Automated Decision Systems, The Artificial Intelligence field, Basic concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, and Development of Expert Systems.	**8**

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**
Formative Assessment as per guidelines.	

Text Books:	
1	Ramesh Sharda, Dursun Delen, Efraim Turban, J.E.Aronson, Ting-Peng Liang, David King, "Business Intelligence and Analytics: System for Decision Support", 10th Edition, Pearson GlobalEdition. Reference books
2	Data Analytics: The Ultimate Beginner's Guide to Data Analytics Paperback – 12 November 2017by Edward Miz
Additional Reading:	
1	https://shorturl.at/iuAT0
2	https://www.coursera.org/courses?query=business%20intelligence

Program Name	**B.C.A**	Semester	**V**
Course Title	**Digital Marketing (Theory)**		
Course Code:	**Voc-1**	No. of Credits	**03**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 ½ hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

1. Understand the fundamental concepts and principles of digital marketing.
2. Develop practical skills to implement various digital marketing strategies and techniques.
3. Analyze and evaluate the effectiveness of digital marketing campaigns.
4. Apply critical thinking and problem-solving skills to real-world digital marketing scenarios.
5. Create comprehensive digital marketing plans and strategies.

Note: Blooms Level(BL): L1=Remember, L2=Understand, L3=Apply, L4=Analyze, L5= Evaluate, L6= Create

Contents	**42 Hrs**
Introduction to Digital Marketing: Overview of digital marketing, Evolution of digital marketing, Importance and benefits of digital marketing, Digital marketing channels and platforms **Digital Marketing Strategy and Planning:** Developing a digital marketing strategy, Setting goals and objectives, Budgeting, and resource allocation.	**8**
Campaign planning and execution, Monitoring and adjusting digital marketing campaigns **Social Media Marketing:** Overview of social media marketing, Social media platforms and their features, Creating and optimizing social media profiles, Social media content strategy, Social media advertising and analytics	**8**
Email Marketing: Introduction to email marketing, Building an email list, Creating effective email campaigns, Email automation and segmentation, Email marketing metrics and analytics **Content Marketing:** Understanding content marketing, Content strategy and planning,	**8**
Content creation and distribution, Content promotion and amplification, Content marketing metrics and analytics. **Mobile Marketing:** Mobile marketing overview, Mobile advertising strategies, Mobile app marketing, Location-based marketing, Mobile marketing analytics	**8**
Analytics and Reporting: Importance of analytics in digital marketing, Setting up web analytics tools (e.g., Google Analytics), Tracking and measuring key performance indicators (KPIs), Conversion tracking and optimization, Reporting and data visualization	**10**

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**
Formative Assessment as per guidelines.	

References	
1	"Digital Marketing Strategy: An Integrated Approach to Online Marketing" by Simon Kingsnorth.
2	"Email Marketing Rules: How to Wear a White Hat, Shoot Straight, and Win Hearts" by Chad S. White
3	"Content Inc.: How Entrepreneurs Use Content to Build Massive Audiences and Create Radically Successful Businesses" by Joe Pulizzi
4	"Mobile Marketing: How Mobile Technology is Revolutionizing Marketing, Communications and Advertising" by Daniel Rowles
5	"Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity" by Avinash Kaushik

Program Name	**B.C.A**	Semester	**VI**
Course Title	Artificial Intelligence and Applications **(Theory)**		
Course Code:	DSC-C26	No. of Credits	**04**
Contact hours	**52 Hours**	Duration of SEA/Exam	**2 1/2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Gain a historical perspective of AI and its foundations.
CO2	Become familiar with basic principles and strategies of AI towards problem solving
CO3	Understand and apply approaches of inference, perception, knowledge representation, and learning.
CO4	Understand the various applications of AI

Contents	**52 Hrs**
Introduction- Concept of Artificial Intelligence, Foundations of AI, History, AI - Past, Present and Future. Intelligent Agents- Environments- Specifying the task environment, Properties of task environments, Agent based programs-Structure of Agents, Types of agents- Simple reflex agents, Model-based reflex agents, Goal-based agents; and Utility-based agents.	10
Problem Solving by Searching-Problem-Solving Agents, Well-defined problems and solutions, examples Problems, Searching for Solutions, Uninformed Search Strategies- Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search, Greedy best-first search, A* Search, AO* search Informed (Heuristic) Search Strategies, Heuristic Functions	10
Knowledge Representation - Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic, First-Order Logic-Syntax and Semantics of First-Order Logic, Using First-Order Logic, Unification and Lifting Forward Chaining, Backward Chaining	12
Learning– Forms of Learning, Supervised Learning, Machine Learning - Decision Trees, Regression and Classification with Linear Models, Artificial Neural Networks, Support Vector Machines	10
Applications of AI - Natural Language Processing, Text Classification, and Information Retrieval, Speech Recognition, Image processing and computer vision, Robotics	10

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**

Formative Assessment as per guidelines.	
Text Books:	
1	Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 2nd Edition, Pearson Education, 2003
2	Tom Mitchell, "Machine Learning", 1st Edition, McGraw-Hill,2017
3	Elaine Rich, Kevin Knight, Shivashankar B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition, 2013

Program Name	**B.C.A**	Semester	**VI**
Course Title	Artificial Intelligence and Applications LAB		
Course Code:	DSC-C27	No. of Credits	**02**
Contact hours	**04 Hours per week**		
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Course Outcomes:

- Identify and Apply Artificial Intelligence concepts to solve real world problems.
- Develop learning programs for Supervised learning models.
- Design and develop solutions for informed and uninformed search problems in AI.

Programs:

1. Write a program to implement breadth first search using python.
2. Write a program to implement depth first search using python.
3. Write a program to implement 8-puzzle problem using python
4. Write a program to implement n-queens problem using python.
5. Write a program to implement alpha-beta pruning using python.
6. Write a program to implement forward chaining algorithm.
7. Write a program to implement backward chaining algorithm.
8. Write a program to implement k-Nearest Neighbour algorithm to classify the Iris data set. Print both correct and wrong predictions.
9. Train a random sample data using linear regression model and plot the graph
10. Implement the naïve Bayesian classifier for a sample training data set stored as a .csv file. Compute the accuracy of the classifier, considering few test data sets.
11. Demonstrate the working of SVM classifier for a suitable data set(e.g., Iris dataset)
12. Build a sample binary image classification model (cat and dog)

Evaluation Scheme for Lab Examination

Assessment Criteria Marks	Marks
Writing the Program	10
Execution and Formatting	10
Viva Voce	2
Practical Record	3
Total	**25**

Note:

- The programs can be implemented using Jupyter notebook IDE with scikit-learn library or
- native Phyton IDLE with required packages.
- Packages can be downloaded and installed separately without any internet connection.

Program Name	**BCA**	Semester	**VI**
Course Title	**PHP & MySQL (Theory)**		
Course Code:	**DSC-C28**	No. of Credits	**04**
Contact hours	**52 Hours**	Duration of SEA/Exam	**2 1/2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes: After the successful completion of the course, the student will be able to:

CO1. Design dynamic and interactive web pages and websites.

CO2. Run PHP scripts on the server and retrieve results.

CO3. Handle databases like MySQL using PHP in websites.

Note: Blooms Level(BL): L1=Remember, L2=Understand, L3=Apply, L4=Analyze, L5= Evaluate, L6= Create

Contents	**52 Hrs**
Introduction to PHP: Introduction to PHP, History and Features of PHP, Installation & Configuration of PHP, Embedding PHP code in Your Web Pages, Understanding PHP, HTML and White Space, Writing Comments in PHP, Sending Data to the Web Browser, Data types in PHP, Keywords in PHP, Using Variables, Constants in PHP, Expressions in PHP, Operators in PHP.	**10**
Programming with PHP: Conditional statements: if, if-else, switch, The? Operator**,** Looping statements: while Loop, do-while Loop, for Loop **Arrays in PHP:** Introduction- What is Array? Creating Arrays, Accessing Array elements, Types of Arrays: Indexed v/s Associative arrays, Multidimensional arrays, Creating Array, Accessing Array, Manipulating Arrays, Displaying array, Using Array Functions, Including and Requiring Files- use of Include() and Require(), Implicit and Explicit Casting in PHP.	**12**
Functions, and Strings in PHP: Functions in PHP, Function definition, Creating and invoking user-defined functions, Formal parameters versus actual parameters, Function and variable scope, Recursion, Library functions, Date and Time Functions **Strings in PHP:** What is String? Creating and Declaring String, String Functions	**10**
Class &Objects in PHP: What is Class & Object, Creating and accessing a Class &Object, Object properties, object methods, Overloading, inheritance, Constructor and Destructor **Form Handling:** Creating HTML Form, Handling HTML Form data in PHP **Database Handling Using PHP with MySQL: I**ntroduction to MySQL: Database terms, Data Types.	**10**
Accessing MySQL –Using MySQL Client and Using php MyAdmin, MySQL Commands, Using **PHP with MySQL:** PHP MySQL Functions, Connecting to MySQL and Selecting the Database, Executing Simple Queries, Retrieving Query Results, Counting Returned Records, Updating Records with PHP	**10**

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/

Formative Assessment as per guidelines.	
1	PHP & MySQL for Dynamic Web Sites- Fourth Edition By Larry Ullman.
2	Learning PHP, MySQL and JavaScript By Robin Nixon –O"REILLY Publications
3	Programming PHP By Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre
4	SAMS Teach Yourself PHP in 24 hours, Author: Matt Zandstra, Sams Publishing

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**

Program Name	**B.C.A**	Semester	**VI**
Course Title	**PHP and MySQL Lab**		
Course Code:	**DSC-C29**	No. of Credits	**02**
Contact hours	**04 Hours per week**		
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Practical Assignments for PHP Programming

Sl. No	Title of the Experiment
1	Write a PHPscript to print "hello world".
2	Write a PHPscript to find odd or even number from given number.
3	Write a PHPscript to find maximum of three numbers.
4	Write a PHPscript to swap two numbers.
5	Write a PHPscript to find the factorial of a number.
6	Write a PHPscript to check whether given number is palindrome or not.
7	Write a PHP script to reverse a given number and calculate its sum
8	Write a PHP script to to generate a Fibonacci series using Recursive function
9	Write a PHP script to implement atleast seven string functions.
10	Write a PHP program to insert new item in array on any position in PHP.
11	Write a PHP script to implement constructor and destructor
12	Write a PHP script to implement form handling using get method
13	Write a PHP script to implement form handling using post method.
14	Write a PHP script that receive form input by the method post to check the number is prime or not
15	Write a PHP script that receive string as a form input
16	Write a PHP script to compute addition of two matrices as a form input.
17	Write a PHP script to show the functionality of date and time function.
18	Write a PHP program to upload a file
19	Write a PHP script to implement database creation
20	Write a PHP script to create table
21	Develop a PHP program to design a college admission form using MYSQL database.

Evaluation Scheme for Lab Examination

Assessment Criteria Marks	Marks
Writing the Program	10
Execution and Formatting	10
Viva Voce	2
Practical Record	3
Total	**25**

Program Name	**B.C.A**	Semester	**VI**
Course Title	**Fundamentals of Data Science (Theory)**		
Course Code:	**DSE-E2**	No. of Credits	**03**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 1/2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Understand the concepts of data and pre-processing of data.
CO2	Know simple pattern recognition methods
CO3	Understand the basic concepts of Clustering and Classification
CO4	Know the recent trends in Data Science

Contents	**42 Hrs**
Unit I: Data Mining: Introduction, Data Mining Definitions, Knowledge Discovery in Databases (KDD) Vs Data Mining, DBMS Vs Data Mining, DM techniques, Problems, Issues and Challenges in DM, DM applications.	**8**
Data Warehouse: Introduction, Definition, Multidimensional Data Model, Data Cleaning, Data Integration and transformation, Data reduction, Discretization	**8**
Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods -Apriori and Frequent Pattern Growth (FPGrowth) algorithms -Mining Association Rules	**8**
Classification: Basic Concepts, Issues, Algorithms: Decision Tree Induction. Bayes Classification Methods, Rule-Based Classification, Lazy Learners (or Learning from your Neighbors), k Nearest Neighbor. Prediction - Accuracy- Precision and Recall	**10**
Clustering: Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering	**8**

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**

Text Books:

1	Jiawei Han and Micheline Kambar – "Data Mining Concepts and Techniques" Second Edition Elsevier Publications
2	Arun K Pujari – "Data Mining Techniques" 4th Edition, Universities Press
3	Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2012.
4	K.P.Soman, Shyam Diwakar, V.Ajay: Insight into Data Mining – Theory and Practice, PHI
5	Pang-Ning Tan, Michael Steinbach, Vipin Kumar - "Introduction to Data Mining", Pearson Education

Program Name	**B.C.A**	Semester	**VI**
Course Title	**Mobile Application Development (Theory)**		
Course Code:	**DSE-E2**	No. of Credits	**03**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 1/2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Create Servlets for server-side programming Create, test and debug Android application by setting up Android development environment
CO2	Critique mobile applications on their design pros and cons,
CO3	Program mobile applications for the Android operating system and understand techniques for designing and developing sophisticated mobile interfaces
CO4	Deploy applications to the Android marketplace for distribution.

Contents	**42 Hrs**
Android OS design and Features: Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools, Building your First Android application.	**8**
Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.	**8**
Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.	**8**
Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	**8**
Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Deploying Android Application to the World.	**10**

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**
Formative Assessment as per guidelines.	

Text Books:	
1	Lauren Darcey and Shane Conder , “Android Wireless Application Development”, Pearson Education,2nd ed. (2011)
2	Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
3	Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
4	Android Application Development All in one for Dummies by Barry Burd, Edition: I
5	Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
6	Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

Program Name	**B.C.A**	Semester	**V**
Course Title	**Web Content Management System (Theory)**		
Course Code:	**Voc-2**	No. of Credits	**03**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 1/2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Understand content development basics;
CO2	Gain Knowledge of tools for multimedia content development for audio/ video, graphics, animations, presentations, screen casting
CO3	Host websites and develop content for social media platforms such as wiki and blog
CO4	Understand e-publications and virtual reality
CO5	Use of e-learning platform Moodle and CMS applications Drupal and Joomla

Contents	**42 Hrs**
Web Content Development and Management, Content Types and Formats, Norms and Guidelines of Content Development, Creating Digital Graphics, Audio Production and Editing,	**8**
Web Hosting and Managing Multimedia Content, Creating and Maintaining a Wiki Site. Presentation Software Part I, Presentation Software Part II, Screen casting Tools and Techniques, Multilingual Content Development.	**8**
Planning and Developing Dynamic Web Content Sites, Website Design Using CSS Creating and Maintaining a WIKI Site, Creating and Managing a Blog Site,	**8**
E- Publication Concept, E- Pub Tools, Simulation and Virtual Reality Applications, Creating 2D and 3 D Animations. Introduction to Moodle, Creating a New Course and Uploading,	**10**
Create and Add Assessment, Add and Enroll User and Discussion Forum, Content Management System: Joomla, Content Management System: Drupal	**8**

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	**40 Marks**

Text Books:	
1	Web Content Management: Systems, Features, and Best Practices 1st Edition by Deane Barker.
2	Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko.
3	Moodle for Learning Management System (LMS): A Practical and Visual Guidebook of Administrator and Instructor for Distance Education Paperback – October 12, 2020 by James Koo
4	Using Joomla!: Efficiently Build and Manage Custom Websites 2nd Edition by Ron Severdia
Additional Reading:	
https://onlinecourses.swayam2.ac.in/cec20_lb09/preview	

1. **<u>Pattern and Scheme of Examination for VI Sem BCA Project Work (DSC-C30)</u>**

- Each project can be done by a maximum of 4 students.
- The distribution of marks for Assessment is as follows:

C1	C2	C3
20	20	60

- C3 marks distribution in the final examination is as follows:
    1. Project Report: 20 marks
    2. Presentation and Demonstration: 30 marks
    3. Viva-Voce: 10 marks

2. **Guidelines for Internship is as per the notification by the University of Mysore vide reference AC2(S)/525/2009-10 Dated 29/02/2024.**

3. **<u>Question Paper Pattern for Theory C3 (60 Marks) for V and VI Sem BCA:</u>**

Answer Part A and Part B

Part A: Answer all the questions. Each Question carries 10 marks:

1. a1) a2) … OR b1) b2) …
2. a1) a2) … OR b1) b2) …
3. a1) a2) … OR b1) b2) …
4. a1) a2) … OR b1) b2) …
5. a1) a2) … OR b1) b2) …

Part B: Answer any five questions. Each Question carries 2 marks:

6. 7. 8. 9. 10. 11. 12.13.