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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING**

**AND**

**TECHNOLOGY**

**DEPARTMENT**

**OF**

**COMPUTER SCIENCE AND ENGINEERING**

**Master of Technology (M.Tech)**

**In**

**Computer Science & Engineering Programme**

**W.e.f. AY 2020-21**

**SoET 2.0**

**(Engineering +)**

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**ADAMAS UNIVERSITY, KOLKATA**

**SCHOOL OF ENGINEERING & TECHNOLOGY**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**VISION OF THE UNIVERSITY**

**To be an internationally recognized university through excellence in inter-disciplinary education,research and innovation, preparing socially responsiblewell-grounded individuals contributing to nation building.**

**MISSION STATEMENTS OF THE UNIVERSITY**

**M.S 01: Improve employability through futuristic curriculum and progressive pedagogy**

**with cutting-edge technology**

**M.S 02: Foster outcomes based education system for continuous improvement in**

**education, research and all allied activities**

**M.S 03: Instill the notion of lifelong learning through culture of research and innovation**

**M.S 04: Collaborate with industries, research centers and professional bodies to stay**

**relevant and up-to-date**

**M.S 05: Inculcate ethical principles and develop understanding of environmental and**

**social realities**

**CHANCELLOR / VICE CHANCELLOR**

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**ADAMAS UNIVERSITY, KOLKATA**

**SCHOOL OF ENGINEERING & TECHNOLOGY**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**VISION OF THE SCHOOL**

To develop well-grounded, socially responsible engineers and technocrats in a way to create a transformative impact on Indian society through continual innovation in education, research, creativity and entrepreneurship.

**MISSION STATEMENTS OF THE SCHOOL**

**M.S. 01:**Build a transformative educational experience through disciplinary and inter-disciplinary knowledge, problem solving, and communication and leadership skills.

**M.S. 02:**Develop a collaborative environment open to the free exchange of ideas, where research, creativity, innovation and entrepreneurship can flourish among individual students.

**M.S. 03:** Impact society in a transformative way – regionally and nationally - by engaging with partners outside the borders of the university campus.

**M.S. 04:**Promote outreach programs which strives to inculcate ethical standards and good character in the minds of young professionals.

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**DEAN / SCHOOL CONCERNED**

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**ADAMAS UNIVERSITY, KOLKATA**

**SCHOOL OF ENGINEERING & TECHNOLOGY**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**VISION OF THE DEPARTMENT**

Graduates of the Department of Computer Science and Software Engineering will be recognized as innovative leaders in the fields of computer science and software engineering. This recognition will come from their work in software development in a myriad of application areas, as well as through their work in advanced study and research. The faculty is, and will continue to be, known for their passion for teaching and for their knowledge, expertise, and innovation in advancing the frontiers of knowledge in computer science and software engineering.

**MISSION STATEMENTS OF THE DEPARTMENT**

**M.S 01:** Our mission is to teach and prepare liberally educated, articulate, and skilled computer scientists and software engineers for leadership and professional careers and for advanced study.

**M.S 02:** A central objective of our program is to contribute to society by advancing the fields of computer science and software engineering through innovations in teaching and research, thus enhancing student knowledge through interactive instruction, global engagement, and experiential learning.

**M.S 03:** The program will serve as a resource to inform society about innovations related to the production and uses of computers and software.

**M.S 04:** To impart moral and ethical values, and interpersonal skills to the students.

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**HOD DEAN / SCHOOL CONCERNED**

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**ADAMAS UNIVERSITY, KOLKATA**

**SCHOOL OF ENGINEERING & TECHNOLOGY**

**Name of the Programme: M.Tech (Computer Science & Engineering)**

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

**PEO 01:** To prepare professionals who will have successful career in industries, academia, research and entrepreneurial endeavors.

**PEO 02:** To prepare graduates who will demonstrate analytical, research, design and implementation skills offering techno-commercially feasible and socially acceptable solutions to real life problems.

**PEO 03:** To prepare graduates who will thrive to pursue life-long learning and contribute to society as an ethical and responsible citizen.

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**HOD DEAN / SCHOOL CONCERNED**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

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**ADAMAS UNIVERSITY, KOLKATA**

**Name of the Programme: M.Tech (Computer Science & Engineering)**

**GRADUATE ATTRIBUTE / PROGRAMME OUTCOME (PO)**

**GA 01 / PO 01: Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**GA 02 / PO 02: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching sustained conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**GA 03 / PO 03: Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**GA 04 / PO 04: Conduct Investigations of Complex Computing Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

**GA 05 / PO 05: Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**GA 06 / PO 06: The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**GA 07 / PO 07: Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**GA 08 / PO 08: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**GA 09 / PO 09:Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**GA 10 / PO 10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**GA 11 / PO 11: Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**GA 12 / PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.**

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**HOD DEAN / SCHOOL CONCERNED**

**SCHOOL OF ENGINEERING & TECHNOLOGY**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING**

**AND**

**TECHNOLOGY**

**DEPARTMENT**

**OF**

**COMPUTER SCIENCE AND ENGINEERING**

**Course Structure &Syllabus**

**For**

**Master of Technology (M.Tech)**

**In**

**Computer Science & Engineering**

**W.e.f. AY 2020-21**

**SoET 2.0**

**(Engineering +)**

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| **ADAMAS UNIVERSITY**  **SCHOOL OF ENGINEERING & TECHNOLOGY**  **PG PROGRAM: Master of Technology (M.Tech) (CSE)**  **SEMESTER I** | | | | | | | | |
| **Sl. No** | **Type of Course** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Contact**  **Hrs./Wk.** | **Credits** |
| 1 | Theory | ECS61101 | Foundation of Computing Science | 3 | 1 | 0 | 4 | 4 |
| 2 | Theory | ECS61103 | Advanced Algorithms | 3 | 1 | 0 | 4 | 4 |
| 3 | Theory |  | Elective II | 3 | 0 | 0 | 3 | 3 |
| 4 | Theory |  | Elective III | 3 | 0 | 0 | 3 | 3 |
| 5 | Seminar | ECS61301 | Seminar -I | 0 | 2 | 0 | 2 | 2 |
| 6 | Practical | ECS61201 | Computing Lab -I | 0 | 0 | 3 | 3 | 2 |
| **Total** | | | | **12** | **4** | **3** | **19** | **18** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ADAMAS UNIVERSITY**  **SCHOOL OF ENGINEERING & TECHNOLOGY**  **PG PROGRAM: Master of Technology (M.Tech) (CSE)**  **SEMESTER II** | | | | | | | | |
| **Sl. No** | **Type of Course** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Contact**  **Hrs./Wk.** | **Credits** |
| 1 | Theory | ECS61102 | Parallel & Distributed Computing | 3 | 1 | 0 | 4 | 4 |
| 2 | Theory |  | Elective IV | 3 | 0 | 0 | 3 | 3 |
| 3 | Theory |  | Elective V | 3 | 0 | 0 | 3 | 3 |
| 4 | Theory |  | Elective VI | 3 | 0 | 0 | 3 | 3 |
| 5 | Theory |  | Elective VII | 3 | 0 | 0 | 3 | 3 |
| 6 | Seminar | ECS61302 | Seminar -II | 0 | 2 | 0 | 2 | 2 |
| 7 | Practical | ECS61202 | Computing Lab –II | 0 | 0 | 3 | 3 | 2 |
| **Total** | | | | **15** | **3** | **3** | **21** | **20** |

**Total Credits (First Year): 38**

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| **ADAMAS UNIVERSITY**  **SCHOOL OF ENGINEERING & TECHNOLOGY**  **PG PROGRAM: Master of Technology (M.Tech) (CSE)**  **SEMESTER III** | | | | | | | | |
| **Sl. No** | **Type of Course** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Contact**  **Hrs./Wk.** | **Credits** |
| 1 | Theory |  | Elective -VIII | 3 | 0 | 0 | 3 | 3 |
| 2 | Seminar | ECS62301 | Technical Report Writing & Seminar – I | 0 | 0 | 6 | 6 | 4 |
| 3 | Project | ECS62401 | Thesis (Part – I) | 0 | 0 | 24 | 24 | 16 |
| **Total** | | | | **3** | **0** | **30** | **33** | **23** |

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| **ADAMAS UNIVERSITY**  **SCHOOL OF ENGINEERING & TECHNOLOGY**  **PG PROGRAM: Master of Technology (M.Tech) (CSE)**  **SEMESTER IV** | | | | | | | | |
| **Sl. No** | **Type of Course** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Contact**  **Hrs./Wk.** | **Credits** |
| 1 | Seminar | ECS62302 | Technical Report Writing & Seminar - II | 0 | 0 | 6 | 6 | 4 |
| 2 | Project | ECS62402 | Thesis(Part – II) | 0 | 0 | 27 | 27 | 18 |
| 3 | Viva | ECS62502 | Comprehensive Viva |  |  |  |  | 4 |
| **Total** | | | | **0** | **0** | **33** | **33** | **26** |

**Total Credits (Second Year): 49**

**Total Credits (Over Two Years): 87**

**List of Elective Papers:**

**Elective – II:**

**ECS61105 Pattern Recognition**

**ECS61107 Artificial Intelligence**

**ECS61109 Logic Programming**

**ECS61111 Soft Computing**

**Elective – III:**

**ECS61113 Image and Video Processing**

**ECS61115 Advanced Graph Theory**

**EEC61127 VLSI Design**

**EEC61129 Mobile Computing**

**Elective – IV:**

**ECS61104 Advanced Database System**

**ECS61106 Cloud Computing**

**ECS61108 Neural Network and Deep Learning**

**ECS61110 Advances in Compiler Design**

**Elective – V:**

**ECS61112 Machine Learning**

**ECS61114 Information Retrieval**

**ECS61116 Computational Complexity**

**Elective – VI:**

**ECS61118 Formal Systems**

**ECS61120 Principles of Programming Languages**

**ECS61122 High Performance Computer Architecture**

**Elective – VII:**

**ECS61124 Natural Language Processing**

**EEC61128 Internet of Things**

**MBA61142 E-Commerce**

**Elective – VIII:**

**ECS62101 Cryptography & Cryptosystems**

**ECS62103 Information Security**

**ECS62105 Cyber Security**

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| **ECS61101** | **Foundation of Computing Science** | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours -60** | **3** | **1** | **0** | **4** |
| **Pre-requisites/Exposure** | **Discrete Mathematics, Programming Concepts** | | | | |
| **Co-requisites** |  | | | | |

**Course Objectives:**

* To develop an in-depth understanding of the Propositional Logic, Propositional Calculus and Predicate Calculus, Inference Rules, Boolean Algebra, Sets, Relation and Function, Algebraic Structures and Morphism,.
* Students should be able to demonstrate application using the above mathematical tools in computer science engineering.
* Design grammars and recognizers for different formal languages
* Prove or disprove theorems in automata theory using its properties
* Determine the decidability and intractability of computational problems

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Define** the fundamental knowledge to state the mathematical skills in basic and advance

algebraic structures.

**CO2. Define** the fundamental knowledge to state the mathematical skills in Discrete Structure & Logic and allied fields.

**CO3. Define** the basic concepts in formal language theory, grammars, automata theory,

Computability Theory, and complexity theory.

**CO4. Demonstrate** abstract models of computing, including deterministic (DFA), non-

Deterministic (NFA), Push Down Automata (PDA) and Turing (TM) machine models

and their power to recognize the languages.

**CO5. Prove** and disprove theorems establishing key properties of formal languages and

automata.

**Catalog Description:**

For any program related to Computer Science study of computational Mathematics is very much important. The purpose of this course is to understand and use (abstract) discrete structures and advance algebraic structure that are backbones of computer science. In particular, this course is meant to introduce logic, proofs, sets, relations, functions, counting, and recurrence relation, with an emphasis on applications in computer science.

**Course Content:**

**Unit I: 12 lecture hours**

**Discrete Structures:** Sets, Relations and Functions, Morphisms; Posets and Lattices, Boolean algebra, Proof Techniques: Inductive and Deductive Reasoning, Proof by Contradiction; Recurrence Relations, Algebraic Structures – Semigroup, Monoid, Group, Ring and Field.

**Unit II: 12 lecture hours**

**Logic:** Statements and Symbolic Representation, Propositional Calculus and Predicate Calculus, Inference Rules, Satisfiability and Validity, Resolution Principle, Notions of Soundness and Completeness.

**Unit III: 15 lecture hours**

**Automata and Languages:** Strings, Phrase Structured Grammar and Formal Languages: Finite Automata and Regular Expressions, Closure Properties of Regular Languages, Pumping Lemma and Non-Regular Languages. Context Free Languages (CFL) and Pushdown Automata (PDA), Normal Forms of Context Free Languages, Closure Properties of CFLs, Pumping Lemma and Non-Context Free Languages, Deterministic Pushdown Automata and DCFLs. Chomsky Hierarchy of Grammars and Corresponding Acceptors ; Turing Machines, and Type 0 Languages, Recursive and Recursively Enumerable Languages, Turing Computable Functions, Primitive and µ-recursive functions.

**Unit IV: 13 lecture hours**

**Computability:** Church-Turing Thesis, Decision Problems, Decidability and Undecidability, Universal Turing Machine, Halting Problem of Turing Machines, Problem Reduction (Turing and Mapping Reduction).

**Unit V: 8 lecture hours**

**Computational Complexity:** Time and Space Complexity Measures; Class P and Class NP and Co-NP problems NP-Completeness.

**Text Books:**

T1. Kenneth H. Rosen,Discrete Mathematics and its Applications, Tata McGraw - Hill.

T2. V Somasundaram, Discrete Mathematics with Graph Theory and Combinatory, Tata McGraw- Hill.

T3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

**Reference Books:**

R1. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.

R2. Discrete Mathematics for Computer Science”, Illustrated Edition, Kenneth Bogart, Clifford Stein, Robert L. Drysdale, Key College Publishing.

**Modes of Examination: Assignment/Quiz/Project/Presentation/Written Exam**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Class Assessment** | **Mid term** | **End Term** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)**

**Mapping between COs, POs and PSOs**

|  |  |  |
| --- | --- | --- |
| **Course Outcomes (COs)** | | **Mapped POs and PSOs** |
| **CO1** | **Define** the fundamental knowledge to state the mathematical skills in basic and advance algebraic structures. | **PO1,PO2** |
| **CO2** | **Define** the fundamental knowledge to state the mathematical skills in Discrete Structure & Logic and allied fields. | **PO1,PO2** |
| **CO3** | **Define** the basic concepts in formal language theory, grammars, automata theory, Computability Theory, and complexity theory | **PO1, PO2, PO4** |
| **CO4** | **Demonstrate** abstract models of computing, including deterministic (DFA), Non-Deterministic (NFA), Push Down Automata (PDA) and Turing (TM) machine models and their power to recognize the languages. | **PO2, PO3, PO5** |
| **CO5** | **Prove** and disprove theorems establishing key properties of formal languages and automata. | **PO3, PO4** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61101 | Foundation of Computing Science | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - |

1=weakly mapped 2= moderately mapped 3=strongly mapped

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: I Stream: CSE

PAPER TITLE: Foundation of Computing Science PAPER CODE: ECS61101

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 02

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Find** whether () is a tautology or contradiction. | **R** | **CO2** |
| 2. | **Find** whether () is a tautology or contradiction. | **R** | **CO2** |
| ­­­ 3. | **What** do you understand by formal language? | **R** | **CO1** |
| 4. | **What** do you understand by ‘**proper subset**’ and ‘**subset**’? | **R** | **CO2** |
| 5. | **What** do mean by grammar and when it is regular. | **R** | **CO1** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Show** that is a valid conclusion from the premises:  . | **R** | **CO2** |
| 7. | **Show** that is an abelian group, where the binary operation is defined as . | **R** | **CO1** |
| 8. | **Define**& explain the closure properties of regular language. | **R** | **CO2** |
| 9. | **Constract** a DFA that accepts the language L over Σ={a,b} such that number a’s and b’s is divisible by 2 and 3 respectively. **Develop** the homomorphic image of L provided Γ ={0,1}, h(a)= “0” & h(b)= “1” | **Ap** | **CO2** |
|  | **SECTION C (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | i) **Show** that the cube roots of unity forms an abelian group under complex multiplication.  ii) **Find** the negation of the statement: **5+5** | **R**  **R** | **CO1**  **CO2** |
| 11. | i) **Find** the CNF of , without using truth table.  **5+5** | **R** | **CO2** |
| 12. | **Develop** the transition functions of a language L={ambmcndn| m,n>0}, if accepted by deterministic pushdown automata. | **Ap** | **CO3** |

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| **ECS61103** | Advanced Algorithms | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours-60** | **3** | **1** | **0** | **4** |
| **Pre-requisites/Exposure** | **Basic Knowledge of data structures** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To develop algorithmic thinking of students and their ability to analyse the efficiency of different algorithms
* To enable students to find different approaches for dealing with challenging computational problems
* To provide insight into different types of algorithms for solving different computational problems

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Apply** a suitable analysis method for any given algorithm

CO2. **Analyze** correctness and running-time bounds

CO3. **Design** new algorithms for variations of problems studied in class

CO4. **Select** appropriately an algorithmic paradigm for the problem at hand

CO5**. Define** formally an algorithmic problem

CO6: **Discuss** different classification of algorithms with their applications

**Catalog Description:**

Algorithms and algorithmic problem solving are at the heart of computer science. This module teaches the design and analysis of advanced efficient algorithms for solving computational problems. Students learn about general algorithmic tools for solving a variety of optimization problems efficiently, how to design algorithms for challenging problems and how to analyze the performance of off-the-shelf general purpose algorithms for specific optimization problems.

**Course Content:**

**Unit I: 10 lecture hours**

**Data Structures:**Basic Data Structuring Problems: Fibonacci Heaps, Priority Queues, Dynamic Data Structures for Graph Connectivity/Reachability.

**Unit II: 10 lecture hours**

**Bit Tricks:** Word-level Parallelism. Trans dichotomous Model. O(nlogn) Integer Sorting.

**String Algorithms:** Rabin-Karp Fingerprinting Algorithm, Suffix Trees.

**Maximum Flows:** Augmenting Paths and Push-Relabel Methods. Minimum Cost Flows. Bipartite Matching.

**Unit III: 12 lecture hours**

**Linear Programming:** Formulation of Problems as Linear Programs. Duality. Simplex, Interior Point, and Ellipsoid Algorithms.

**Unit IV**: **12 lecture hours**

**Online Algorithms:**Ski Rental. River Search Problem. Paging. The k-Server Problem. List Ordering and Move-to-Front.

**Approximation Algorithms:**One Way of Coping with NP-Hardness. Greedy Approximation Algorithms. Dynamic Programming and Weakly Polynomial-Time Algorithms. Linear Programming Relaxations. Randomized Rounding. Vertex Cover, Wiring, and TSP.

**Unit V:** **8 lecture hours**

**Fixed-Parameter Algorithms:** Another Way of Coping with NP-Hardness. Parameterized Complexity, Kernelization, Vertex Cover. Connections to approximation.

**Parallel Algorithms:** PRAM. Pointer Jumping and Parallel Prefix. Tree Contraction. Divide and Conquer. Randomized Symmetry Breaking. Maximal Independent Set.

**Unit VI:** **8 lecture hours**

**External-Memory Algorithms:** Accounting for the Cost of Accessing Data from Slow Memory. Sorting. B-trees. Buffer Trees. Cache-oblivious Algorithms for Matrix Multiplication and Binary Search.

**Computational Geometry:** Convex Hull. Line-segment Intersection. Sweep Lines. Voronoi Diagrams. Range Trees. Seidel's Low-dimensional LP Algorithm.

**Streaming Algorithms:** Sketching, Distinct and Frequent Elements.

**Text Books:**

1. “Introduction to Algorithms”, Cormen, Leiserson, Rivest, and Stein, 2nd ed. Cambridge, MA: MIT Press, 2001. ISBN: 0262032937.
2. “Network Flows”, Ahuja, Magnanti, and Orlin, Upper Saddle River, NJ: Prentice Hall, 1993. ISBN: 013617549X.
3. “Randomized Algorithms”, Motwani and Raghavan, Cambridge, UK: Cambridge University Press, 1995. ISBN: 0521474655.

**Reference Books:**

1. “Data Structures and Network Algorithms”, Tarjan, Robert, Philadelphia, PA: Society for Industrial and Applied Mathematics, 1983.
2. “Computational Geometry: Algorithms and Applications”, Berg, Mark de, Marc van Kreveld, Mark Overmars, and Otfried Schwarzkopf, New York, NY: Springer-Verlag, 2000.
3. “Approximation Algorithms for NP-Hard Problems”, Hochbaum, Dorit, ed. , Boston, MA: PWS Publishing Company, 1997.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Apply** a suitable analysis method for any given algorithm | **PO1,PO2** |
| **CO2** | **Analyze** correctness and running-time bounds | **PO1,PO2,PO3** |
| **CO3** | **Design** new algorithms for variations of problems studied in class | **PO1,PO2,PO3,PO5** |
| **CO4** | **Select** appropriately an algorithmic paradigm for the problem at hand | **PO1,PO2,PO4** |
| **CO5** | **Define** formally an algorithmic problem | **PO2,PO6** |
| **CO6** | **Discuss** different classification of algorithms with their applications | **PO1,PO5** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  61103 | Advanced Algorithms | 3 | 3 | 2 | 1 | 2 | 1 | - | - | - | - | - | **-** |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: I Stream: CSE

PAPER TITLE: Advanced Algorithms PAPER CODE: ECS61103

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Define** dynamic programming. | **R** | **CO1** |
| 2. | **What** is an NP-Hard problem? | **R** | **CO2** |
| ­­­ 3. | **Define** Suffix tree. | **R** | **CO3** |
| 4. | **What** is Fibonacci heap? | **R** | **CO4** |
| 5. | **Define** Linear Programming. | **R** | **CO5** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Describe** the Rabin Karp finger printing algorithm. | **U** | **CO4** |
| 7. | **Examine** Ellipsoid algorithm in details. | **An** | **CO5** |
| 8. | **Explain** Johnson’s algorithm to compute all pair shortest path with example. | **U** | **CO2** |
| 9. | **Explain** asymptotic notation of algorithmic time complexity with an example. | **U** | **CO1** |
|  | **SECTION (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Explain** the Travelling Salesman Problem. | **U** | **CO1** |
| 11. | **Explain** Ford Fulkerson method for solving the Maximum flow problem. with example, explain the residual network of a graph. | **U** | **CO6** |
| 12. | **Explain** GrahamScan convex hull finding method with suitable example. | **U** | **CO5** |

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| **ECS61105** | Pattern Recognition (Elective-II) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Algebra, Probability, and Statistics** | | | | |
| **Co-requisites** | **Basics of Machine Learning** | | | | |

**Course Objectives:**

* To equip students with basic mathematical and statistical techniques commonly used in pattern recognition.
* To introduce students to a variety of pattern recognition algorithms.
* Enable students to apply machine learning concepts in real life problems.
* To enable students acquire structure and written expression required for their profession.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1.**Explain** a variety of pattern classification, structural pattern recognition,

and pattern classifier combination techniques.

CO2.**Compare** and parameterize different learning algorithms.

CO3.**Summarize** research in the pattern recognition area verbally and in writing.

CO4.**Apply** performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.

CO5.**Implement** simple pattern classifiers, classifier combinations, and structural pattern recognizers.

**Catalog Description:**

Pattern recognition is the process of recognizing patterns by using machine learning algorithm. Pattern recognition can be defined as the classification of data based on knowledge already gained or on statistical information extracted from patterns and/or their representation. One of the important aspects of the pattern recognition is its application potential. For example, Speech recognition, speaker identification, multimedia document recognition (MDR), automatic medical diagnosis. In a typical pattern recognition application, the raw data is processed and converted into a form that is amenable for a machine to use. Pattern recognition involves classification and cluster of patterns.

**Course Content:**

**Unit I: 6 lecture hours**

**Introduction:** Paradigms for pattern recognition, Statistical and Syntactic pattern Recognition, Soft and Hard computing schemes for pattern recognition. Statistical Pattern Recognition: Patterns and classes, Supervised, Semi-supervised, and Unsupervised classification.

**Unit II: 8 lecture hours**

**Representation:** Vector space representation of patterns and classes, patterns and Classes as strings, Tree-based representations, Frequent item sets for representing classes and clusters, Patterns and classes as logical formulas.

**Unit III: 8 lecture hours**

**Proximity Measures:** Dissimilarity measures, metrics, similarity measures, Edit Distance, Hausdorff metric between point sets, Kernel functions, Contextual and conceptual similarity between points.

**Unit IV: 10 lecture hours**

Dimensionality Reduction: Feature selection: Branch and bound, Sequential feature election, Feature extraction: Fisher's linear discriminant, Principal components as features; Nearest Neighbour Classifiers: Nearest neighbour classifier, Soft nearest neighbour classifiers, Efficient algorithms for nearest neighbour classification, K-Nearest Neighbour classifier, minimal distance classifier, condensed nearest neighbour classifier and its modifications.

**Unit V: 8 lecture hours**

**Bayes Classifier:** Bayes classifier, naïve Bayes classifier, Bayesian Network, Belief network, Decision Trees Axis parallel and oblique decision trees, Learning decision trees, Information gain and Impurity measures.

**Linear Discriminant Functions**: Characterization of the decision boundary,

Weight vector and bias, Learning the discriminant function, Perceptron’s; Support Vector Machines Maximizing the margin, Training support vector machines, Kernel functions.

**Unit VI: 5 lecture hours**

**Clustering:** Clustering process, Clustering algorithms, and Clustering large datasets.

**Combination of Classifiers:** AdaBoost for classification, Combination of Homogeneous classifiers, Schemes for combining classifiers.

**Text Books:**

1. Pattern Recognition Principles, Julius T. Tou, Rafael C. González, Addison-Wesley Pub. Co., 1974.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
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| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

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| **Mapping between COs and POs** | | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** | |
| **CO1** | **Explain** a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques. | **PO1,** | |
| **CO2** | **Compare** and parameterize different learning algorithms. | **PO1, PO2** | |
| **CO3** | **Summarize** research in the pattern recognition area verbally and in writing. | **PO2, PO4** | |
| **CO4** | **Apply** performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature. | **PO1, PO5,** | |
| **CO5** | **Implement** simple pattern classifiers, classifier combinations, and structural pattern recognizers. | **PO1, PO3** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual and team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  61105 | Pattern Recognition (Elective- II) | 3 | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: I Stream: CSE

PAPER TITLE: Pattern Recognition PAPER CODE: ECS61105

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Which** algorithm is used for solving temporal probabilistic reasoning? | **U** | **CO1** |
| 2. | **How** does the state of the process is described in HMM? | **U** | **CO3** |
| ­­­3. | **State** if Bayesian is a heuristic or probabilistic classifier? | **R** | **CO5** |
| 4. | In **which** category of clustering K-Means clustering belong to? | **R** | **CO5** |
| 5. | In PCA **which** concept of mathematics is used? R | **R** | **CO2** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Compare** supervised and unsupervised pattern recognition. | **Ap** | **CO1** |
| 7. | **What** is maximum margin classifier? R **Explain** what are Support vectors in SVM. | **U** | **CO5** |
| 8. | **Define** Pattern recognition. **State** various applications of pattern recognition. | **Ap** | **CO2** |
| 9. | **Define** within-class scatter matrix & between-class scatter matrix. **Discuss** the discriminate analysis for 2-class problem. | **U** | **CO3** |
|  | **SECTION (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Derive** the weight update rule for a single hidden layer in backpropagation. | **R** | **CO5** |
| 11. | **Write** short notes on: - i) Bias ii) Variance. Explain using Simple Linear Regression. | **R** | **CO4** |
| 12. | Cluster the dataset using K-Means clustering into 4 clusters. **Find out** the inter-cluster dissimilarity and intra-cluster similarity. | **U** | **CO5** |

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| **ECS61107** | Artificial Intelligence (Elective -II) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Fundamental concept of math/programming** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To provide the most fundamental knowledge of AI.
* To make a computer that can learn, plan, and solve problems autonomously.
* To give the students a perspective on the main research topics in AI i.e. problem solving, reasoning, planning, etc.
* To enable students to acquire knowledge on some basic search algorithms for problem solving; knowledge representation and reasoning; pattern recognition; fuzzy logic; and neural networks.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1**Define** Artificial Intelligence and its approach.

CO2. **Describe** propositional logic and inference engine.

CO3**. Show** Planning with state-space search.

CO4**. Apply** Bayesian networks and other temporal models.

CO5**. Explain** the types of Learning.

**Catalog Description:**

Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on a computer. The ultimate goal of AI is to make a computer that can learn, plan, and solve problems autonomously. The main research topics in AI include: problem solving, reasoning, planning, natural language understanding, computer vision, automatic programming, machine learning, and so on. Of course, these topics are closely related with each other. For example, the knowledge acquired through learning can be used both for problem solving and for reasoning. In fact, the skill for problem solving itself should be acquired through learning. Also, methods for problem solving are useful both for reasoning and planning. Further, both natural language understanding and computer vision can be solved using methods developed in the field of pattern recognition. In this course, we will study the most fundamental knowledge for understanding AI. We will introduce some basic search algorithms for problem solving; knowledge representation and reasoning; pattern recognition; fuzzy logic; and neural networks.

**Course Content:**

**Unit I: 5 lecture hours**

What is intelligence? Foundations of artificial intelligence (AI). History of AI, Problem Solving: Formulating problems, problem types, states and operators, state space, search strategies.

**Unit II: 10 lecture hours**

Best first search, A\* algorithm, heuristic functions, Iterative deepening A\*(IDA), small memory A\*(SMA); Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning.

**Unit III: 10 lecture hours**

**Reasoning:** Representation, Inference, Propositional Logic, predicate logic (first order predicate logic), logical reasoning, forward chaining, backward chaining; AI languages and tools: Lisp, Prolog, CLIPS**.**

**Unit IV: 8 lecture hours**

**Planning:** Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints.

**Unit V: 5 lecture hours**

**Uncertainty:** Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic, Decision making: Utility theory, utility functions, and Decision, theoretic expert systems.

**Unit VI: 7 lecture hours**

**Inductive learning:** Decision trees, rule based learning, current-best-hypothesis search, least commitment search, neural networks, reinforcement learning, Other learning methods - neural networks, reinforcement learning, genetic algorithms.

**Text Books:**

1. Artificial Intelligence – A Modern Approach, Second Edition, S. Russel and P. Norvig Pearson Education, 2003.

2. “Artificial Intelligence”, Kevin Knight, Elaine Rich, B. Nair, McGraw Hill, 2008.

**Reference Books:**

1. “Artificial Intelligence”, George F. Luger, Pearson Education, 2001.
2. “Artificial Intelligence: A New Synthesis”, Nils J. Nilsson, Morgan Kauffman, 2002.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

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| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Define** Artificial Intelligence and its approach. | **PO1, PO2, PO6** |
| **CO2** | **Describe** propositional logic and inference engine. | **PO3, PO4, PO7, PO12** |
| **CO3** | **Show** Planning with state-space search. | **PO4, PO12** |
| **CO4** | **Apply** Bayesian networks and other temporal models. | **PO12** |
| **CO5** | **Explain** the types of Learning. |  |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  61107 | Artificial Intelligence (Elective -II) | 1 | 1 | 1 | 2 | - | 1 | 1 | - | - | - | - | 3 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION**

Name of the Program: M. Tech Semester: I Stream: CSE

PAPER TITLE: Artificial Intelligence PAPER CODE: ECS61107

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **What** is Turing test? | **R** | **CO1** |
| 2. | **Where** are Rewards and Penalty applied? | **U** | **CO2** |
| ­­­ 3. | **What** is ID3 Algorithm? | **U&R** | **CO4** |
| 4. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ starts from Known Facts to find New Facts. | **R** | **CO3** |
| 5. | **What** are AI neural networks? | **R** | **CO5** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Discuss** Problem Solving Technique of Artificial Intelligence in step wise manner | **Ap** | **CO3** |
| 7. | **State** the comparison Supervised Learning, Unsupervised Learning and Reinforcement Learning. | **U** | **CO2** |
| 8. | **Explain** A\* Searching Algorithm with suitable example. | **An** | **CO5** |
| 9. | **What** is TensorFlow? | **U** | **CO4** |
|  | **SECTION C(Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Define** Inference Engine. Explain Forward Chaining and Backward Chaining with separate examples. | **R** | **CO4,**  **CO1, CO2** |
| 11. | **Explain** First Order Markov Chain and Second Order Markov Chain with suitable examples | **R & U** | **CO5** |
| 12. | **List** some disadvantages related to linear models. | **U** | **CO2** |

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| **ECS61109** | Logic Programming (Elective -II) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Basic computer knowledge** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To translate simple real-world problems into programming algorithms applying a design methodology.
* To create thinking capability with the objective of developing new and original approaches and methods.
* To assessment of the limits of current knowledge and practical application of the latest technology.
* To acquiring advanced scientific knowledge in the computer science field that allows the generating of new ideas within a line of research.
* To propagate ability to assess the importance of information sources, manage them and search for information for carrying out a given research work.

**Course Outcomes:**

On the successful completion of the course, students will be able to

1. **Explain** and analyse the areas where logic programming can be used, especially within the field of Artificial Intelligence.
2. **Analyze** the characteristics of logic programming which may prove advantageous or disadvantageous to the resolution of a given problem.
3. **Create** programming techniques that take advantage of the aforementioned characteristics.
4. **Analyze** the problem using formal logics.
5. **Explain** and justify decisions in the above cases referring to methods and techniques that are known or being researched currently.

**Catalog Description:**

Logic programming is a paradigm in which specifications and programs are expressed within the same language. A first-order Horn logic augmented with some extra-logical features. Modern research in logic programming is concerned with languages including types and modes, higher-order features, constraints, linearity and state, concurrency, and modules. This course provides a thorough introduction to logic programming. We will follow two threads: in one thread we will discuss language design, programming techniques, and theoretical foundations, in the other efficient implementation. As a joint project we will construct a compiler, incrementally adding features as the class progresses.

**Course Content:**

**Unit I: 10 lecture hours**

**Propositional logic:** syntax and semantics, natural deduction proofs, decision procedures, Horn fragment

**Unit II: 15 lecture hours**

**Predicate calculus:** syntax and semantics, natural deduction proofs, un-decidability and incompleteness.

**Unit III: 13 lecture hours**

**Logic Programming:** Horn fragment of predicate logic , unification and top-down operational semantics , use of a logic programming language , Data log and bottom up operational semantics.

**Unit IV: 7 lecture hours**

**Reasoning about sequential programs:** partial correctness assertions, computing weakest preconditions, loop invariants, reasoning about termination.

**Text Books:**

1. “Logic in Computer Science: Modelling and Reasoning about Systems”, M.R. Huth and M.D. Ryan, Cambridge University Press 2000.

**Reference Books:**

1. “Prolog Programming for Artificial Intelligence”, Ivan Bratko, 3rd Edition, Addison-Wesley Publ., 2000.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Class Assessment** | **Mid Term** | **End Term** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Explain** and analyze the areas where logic programming can be used, especially within the field of Artificial Intelligence. | **PO1, PO2, PO6** |
| **CO2** | **Analyze** the characteristics of logic programming which may prove advantageous or disadvantageous to the resolution of a given problem. | **PO3, PO4, PO7, PO12** |
| **CO3** | **Create** programming techniques that take advantage of the aforementioned characteristics. | **PO4, PO12** |
| **CO4** | **Analyze** the problem using formal logics. | **PO12** |
| **CO5** | **Explain** and justify decisions in the above cases referring to methods and techniques that are known or being researched currently. | **PO1, PO2** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61109 | Logic Programming(Elective -II) | 2 | 2 | 1 | 2 | - | 1 | 1 | - | - | - | - | 3 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION**

Name of the Program: M. Tech Semester: I Stream: CSE

PAPER TITLE: Logic Programming PAPER CODE: ECS61109

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Explain** the algorithm for the in-order traversal of the tree for obtaining the string  associated with a formula? | **R** | **CO1** |
| 2. | Check the satisfiability using resolution rule S= { p¬q, q¬r ,rs ,p¬s} | **U** | **CO2** |
| ­­­ 3. | **Construct** the Semantic Tableaux for (A V B) ∧ (¬A ∧ ¬B) | **U&R** | **CO2** |
| 4. | **Prove** Ͱ (¬P→false)→P in Hilbert System | **R** | **CO1, CO3** |
| 5. | **Explain** the procedure for resolution of Propositional Logic Formula. | **U&R** | **CO2** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | a) **Draw** the formation tree and construct the truth tables for the  (P0 ∧ P1)→(P2 V (P1 ↔¬P0)) | **Ap** | **CO3** |
| 7. | **Define** an atomic formula in First Order Logic with examples | **U** | **CO2** |
| 8. | **Define** ground term, ground literal ,ground formula and instances with examples | **An** | **CO5** |
| 9. | **Convert** the following into 3CNF [(A V ¬B) ∧ (¬A → B) ∧ (¬B)] | **U&R** | **CO2** |
|  | **SECTION C(Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | a) **Prove** with the necessary steps the statement: “Every formula in CNF can be  transformed into an equivalent formula in 3CNF.” | **E & R** | **CO4,**  **CO1, CO2** |
| 11. | **Prove** ͰA V ( B ∧ C) → (A V B) ∧ (A V C) in Gentzen System | **R & U** | **CO5** |
| 12. | **Write** axioms and all rules used in Hilbert System | **U&R** | **CO2** |

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| **ECS61111** | Soft Computing(Elective –II) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours-45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Basics of Artificial Intelligence** | | | | |
| **Co-requisites** | **Higher Mathematics** | | | | |

**Course Objectives:**

* To understand theoretical foundations and basics of soft computing.
* To introduce the ideas of fuzzy sets, fuzzy logic and fuzzy inference system.
* To impart knowledge on theory and applications of Neural Networks.
* To introduce basics of genetic algorithms and their applications in optimization and planning.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1**. Discuss** soft computing techniques and artificial neural network.

CO2**. Illustrate** the concepts of fuzzy sets, knowledge representation using fuzzy rules,

approximate reasoning, fuzzy inference systems, and fuzzy logic

CO3**. Design** of neural networks for pattern classification and regression problems

CO4**. Apply** genetic algorithm to combinatorial optimization problems

CO5. **Evaluate** and compare solutions by various soft computing approaches for a given problem.

**Catalog Description:**

The main objective of the course is to expose the students to soft computing, various types of soft computing techniques, and applications of soft computing. This course introduces soft computing methods which, unlike hard computing, are tolerant of imprecision, uncertainty and partial truth. This tolerance is exploited to achieve tractability, robustness and low solution cost. The principal constituents of soft computing are fuzzy logic, neural network theory, and probabilistic reasoning. The course studies the methods and explores how they are employed in associated techniques such as Case-Based Reasoning and expert systems for pattern recognition, clustering, diagnosis, and control both individually and in hybrid arrangement. The basics of each technique will be discussed, and industrial applications will illustrate the strengths of each approach.

**Course Content:**

**Unit I: 3 lecture hours**

**Introduction:** What is soft computing? Differences between soft computing and hard computing, Soft Computing constituents, Methods in soft computing, Applications of Soft Computing.

**Unit II: 12 lecture hours**

**Introduction to Genetic Algorithms:** Introduction to Genetic Algorithms (GA), Representation, Operators in GA, Fitness function, population, building block hypothesis and schema theorem.

**Genetic algorithms operators:** Methods of selection, crossover and mutation, Simple GA(SGA), other variant of GA, generation gap, steady state GA, Applications of GA.

**Unit III: 10 lecture hours**

**Neural Networks:** Concept, biological neural system, Evolution of neural network, McCulloch-Pitts neuron model, activation functions, feed-forward networks, feedback networks, learning rules – Hebbian, Delta, Perceptron learning and Windrow-Hoff, winner-take-all.

**Unit IV: 8 lecture hours**

**Supervised learning:** Perceptron learning, single layer and multilayer perceptron, linear reparability, hidden layers, back propagation algorithm, Radial Basis Function network, Unsupervised learning: Korhonen, Self-Organizing Mapping, Counter-propagation, ART, Reinforcement learning, adaptive resonance architecture, applications of neural networks to pattern recognition systems such as character recognition, face recognition, application of neural networks in image processing.

**Unit V: 7 lecture hours**

**Fuzzy systems:** Basic definition and terminology, set-theoretic operations, Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules & Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making; Neuro-fuzzy modeling, Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rule-base Structure Identification and Neuro-Fuzzy Control , Applications of neuro-fuzzy modelling.

**Unit VI: 5 lecture hours**

**Swarm Intelligence:** What is swarm intelligence? Various animal behaviour which have been used as examples, ant colony optimization, swarm intelligence in bees, flocks of birds, shoals of fish, ant based routing, particle swarm optimization

**Text Books:**

1.Principle of soft computing, S.N. Shivanandam, Wiley. ISBN13: 9788126527410,

2011.

2.Neuro-Fuzzy and Soft Computing, Jyh-Shing Roger Jang, Chuen-Tsai Sun,

EijiMizutani, Prentice Hall of India, 2003.

3.Fuzzy Sets and Fuzzy Logic-Theory and Applications, George J. Klir and Bo Yuan,

Prentice Hall, 1995.

**Reference Books:**

1.Neural Networks Algorithms, Applications, and Programming Techniques”, James A.

Freeman and David M. Skapura, Pearson Education, 2003.

2.Genetic Algorithms in Search, Optimization & Machine Learning”, David E.

Goldberg, Addison Wesley, 1997.

3. An Introduction to Genetic Algorithm, Mitchell Melanie, Prentice Hall, 1998

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Mid Term** | **Attendance** | **Class Assessment** | **End Term** |
| **Weightage (%)** | **20** | **10** | **30** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Discuss** soft computing techniques and artificial neural network. | **PO1, PO2, PO3, PO4** |
| **CO2** | **Illustrate** the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic | **PO1, PO2, PO3, PO4, PO5** |
| **CO3** | **Design** of neural networks for pattern classification and regression problems | **PO1, PO2, PO3, PO4** |
| **CO4** | **Apply** genetic algorithm to combinatorial optimization problems | **PO1, PO2, PO3,**  **PO4, PO5** |
| **CO5** | **Evaluate** and compare solutions by various soft computing approaches for a given problem. | **PO1, PO2, PO3, PO4, PO5, PO12** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61111 | Soft Computing(Elective – II) | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 1 |

1=weakly mapped 2=moderately mapped 3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION**

Name of the Program: M. Tech Semester: I Stream: CSE

PAPER TITLE: Soft Computing (Elective -II) PAPER CODE: ECS61111

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **SECTION A (Answer All questions)** | | | |
| 1. | **What** is computing? **Explain** difference between hard computing and soft computing. | **U** | **CO1**  **CO2** |
| 2. | a) **Explain** Fuzzy Inference System with detailed schematic diagram.  b) **Draw** Fuzzy Inference System with crisp output. | **U** | **CO1** |
| ­­­ 3. | **What** is self-organizing map? Discuss the algorithm along with features of Kohonen’s map. | **U** | **CO1** |
| 4. | **Explain** the various phases of genetic algorithm to control a nonlinear time delay system. | **An** | **CO2**  **CO3** |
| 5 | **What** is Hard computing | **R** | **CO1** |
|  | **SECTION B (**Attempt any **Three Questions)** |  | |
| 6. | **Describe** briefly the modeling and implementation of Fuzzy Logic Controller for inverted pendulum. | **U** | **CO1** |
| 7. | a) **Compare** and contrast Ant colony search algorithm.  b) **Briefly** explain the use of genetic algorithm assuming an application in daily life. | **U** | **CO2** |
| 8. | **Explain** strength and weaknesses of artificial neural network. | **U** | **CO3** |
| 9. | Consider two fuzzy sets  A=  **Perform** union, intersection, difference and complement over fuzzy set A and B. | **U** | **CO4** |
|  | **SECTION C (**Attempt any **Two Questions)** |  | |
| 10. | a) For fuzzy relation R  R= 0.2 0.5 0.7 0.1 0.9  0.3 0.5 0.7 1 0.8  0.4 0.6 0.8 0.9 0.4  0.9 1 0.8 0.6 0.4  **Find** the λ-cut relation for λ=0.2, 0.4, 0.7 and 0.9  b**)Show** that any λ-cut relation of a fuzzy tolerance relation results in a crisp tolerance relation. | **Ap** | **CO2**  **CO4** |
| 11. | a) **What** is the cardinality of a fuzzy set? Whether a power set can be formed for a fuzzy set?  b) **List** some applications of Genetic Algorithm. | **R** | **CO4** |
| 12. | a) **Explain** the concept of swarm intelligence.  b) **For** a speed control of DC motor, the membership functions of series resistance, armature current and speed are given as follows:  Rse=  Ia=  N=  Compute relation T for relating series resistance to motor speed i.e Rse to N. Find max-min composition only. | **U** | **CO5**  **CO4** |

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| **ECS61113** | Image and Video ProcessingElective -III) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours-45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Basic knowledge of image and pixels** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To describe and explain basic principles of digital image processing.
* To design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
* To design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
* To assess the performance of image processing algorithms and video processing and estimation algorithms.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1: **Understand** the need for image transforms different types of image transforms and their properties.

CO2: **Develop** any image processing application and explain different techniques employed for the enhancement of images.

CO3: **Explain** different causes for image degradation and overview of image restoration techniques.

CO4:  **Understand**  the  need  for  image  compression  and  to  learn  the  spatial  and  frequency  domain techniques of image compression, along with steps of video processing.

**Catalog Description:**

This course provides an introduction to basic concepts, methodologies and algorithms of digital image processing focusing on the following two major problems concerned with digital images: (1) image enhancement and restoration for easier interpretation of images, and (2) image analysis and object recognition. Some of the image processing techniques (e.g., spatial domain and frequency domain methods) will also be studied in this course. The primary goal of this course is to lay a solid foundation for students to study advanced image analysis topics such as computer vision systems, biomedical image analysis, and multimedia processing & retrieval, along with video analysis systems.

**Course Content:**

**Unit I: 8 lecture hours**

**Fundamentals of Image processing and Image Transforms:**

Basic steps of Image processing system sampling and quantization of an Image: Basic relationship between pixels Image Transforms: 2D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms.

**Unit II: 15 lecture hours**

**Image Processing Techniques:** Image Enhancement, Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters, Frequency Domain methods - Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering Image Segmentation: Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation.

**Unit III: 10 lecture hours**

**Image Compression:** Image compression fundamentals: coding Redundancy, spatial and temporal redundancy. Compression models: Lossy and Lossless, Huffman coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding , wavelet coding, JPEG standards.

**Unit IV: 12 lecture hours**

**Basic Steps of Video Processing:** Analog video, Digital Video, Time varying Image Formation models, 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals, filtering operations.

**2-D Motion Estimation:** Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.

**Text Books:**

1. “Digital Image Processing”, Gonzaleze and Woods, 3 rdedition , Pearson.
2. “Handbook of image and video processing”, Bovik, Alan C. Academic press, 2010.

**Reference Books:**

1. “Digital video Processing”, M. Tekalp, Prentice Hall International.
2. “Fundamentals of Digital Image Processing A Practical Approach with Examples in Matlab”, Chris Solomon, Toby Breckon, John Wiley & Sons.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

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| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

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| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Understand** the need for image transforms different types of image transforms and their properties. | **PO1,PO2,PO4** |
| **CO2** | **Develop** any image processing application and explain different techniques employed for the enhancement of images. | **PO1,PO2,PO4** |
| **CO3** | **Explain** different causes for image degradation and overview of image restoration techniques. | **PO1,PO2,PO3,PO4** |
| **CO4** | **Understand**  the  need  for  image  compression  and  to  learn  the  spatial  and  frequency  domain techniques of image compression, along with steps of video processing. | **PO4,PO6** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual and team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  61113 | Image and Video Processing(Elective -III) | 3 | 3 | 1 | 3 | - | 1 | - | - | - | - | - | **-** |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: I Stream: CSE

PAPER TITLE: Image and Video Processing(Elective -III) PAPER CODE: ECS61113

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Define** an image. | **U** | **CO1** |
| 2. | **What** is simultaneous contrast? | **U** | **CO2** |
| ­­­ 3. | **Define** maximum filter and minimum filter. | **R** | **CO3** |
| 4. | **Define** sampling. | **R** | **CO4** |
| 5. | **What** is 3D motion model? | **U** | **CO4** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Describe** Discrete wavelet transform. | **U** | **CO1** |
| 7. | **Examine** the objective of image enhancement technique. | **An** | **CO2** |
| 8. | **Elucidate** Image restoration. Mention two areas where image restoration process can be applied. | **U** | **CO3** |
| 9. | **Distinguish** between analog video and digital video. | **Evaluate** | **CO4** |
|  | **SECTION C(Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Explain** the various components of a general purpose image processing system. | **U** | **CO4** |
| 11. | **Explain** application of motion estimation in video coding. | **U** | **CO4** |
| 12. | **Explain** some of the basic relationships that exist between pixels in a digital image. | **U** | **CO1** |

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| **ECS61115** | **Advanced Graph Theory (Elective -III)** | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hour-45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Discrete Mathematics** | | | | |
| **Co-requisites** | **Algorithms** | | | | |

**Course Objectives:**

1. To understand and apply the fundamental concepts in graph theory
2. To apply graph theory based tools in solving practical problems
3. To improve the proof writing skills.

**Course Outcomes:**

On completion of this course, the students will be able to

1. **Solve** problems using basic graph theory
2. **Identify** induced subgraphs, cliques, matchings, covers in graphs
3. **Determine** whether graphs are Hamiltonian and/or Eulerian
4. **Solve** problems involving vertex and edge connectivity, planarity and crossing numbers
5. **Solve** problems involving vertex and edge coloring and modelling real world problems using graph theory

**Catalog Description:**

The course covers basic theory and applications of combinatorics and graph theory. Combinatorics is a study of different enumeration techniques of finite but large sets. Topics that will be studied include principle of inclusion and exclusion, generating functions and methods to solve difference equations. Graph theory is a study of graphs, trees and networks. Topics that will be discussed include Euler formula, Hamilton paths, planar graphs and coloring problem; the use of trees in sorting and prefix codes; useful algorithms on networks such as shortest path algorithm, minimal spanning tree algorithm and min-flow max-cut algorithm.

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**Course Content:**

**Unit I: 14 lecture hours**

**Review of basics:** Graphs and digraphs, incidence and adjacency matrices, isomorphism, the auto homorphism group; Trees: Equivalent definitions of trees and forests, Cayley's formula, the Matrix-Tree theorem, minimum spanning trees. Cut vertices, cut edges, bonds, the cycle space and the bond space, blocks, Menger's theorem; Paths and Cycles: Euler tours, Hamilton paths and cycles, theorems of Dirac, Ore, Bondy and Chvatal, girth, circumference.

**Unit II: 10 lecture hours**

**Matchings:** Berge's Theorem, perfect matchings, Hall's theorem, Tutte's theorem, Konig's theorem, Petersen's theorem, algorithms for matching and weighted matching (bipartitie and general graphs), factors of graphs (decompositions of the complete graph), Tutte's f-factor theorem.

**Unit III: 09 lecture hours**

**Extremal Problems:** Independent sets, covering numbers, Turan's theorem, Ramsey theorems; Colorings: Brooks’s theorem, the greedy algorithm, the Welsh-Powell bound, critical graphs, chromatic polynomials, girth and chromatic number, Vizing's theorem, Graphs on surfaces: Planar graphs, duality, Euler's formula, Kuratowski's theorem, toroidal graphs, 2cell embeddings, and graphs on other surfaces.

**Unit IV: 12 lecture hours**

**Directed Graphs:** Tournaments, directed paths and cycles, connectivity and strongly connected digraphs, branching.

**Networks and flows:** Flow cuts; max flow min cut theorem; perfect square.

**Random Graphs:** The basic models - use of expectations, simple properties of almost all graphs, almost determined variables – use of variance, Hamiltonian cycles, the phase transition.

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| **Text Books:** | |
| 1. | “Introduction to Graph Theory”, Douglas B. West, Prentice Hall of India, 2000. |
| 2. | “Graph Theory with Applications to Engineering and Computer Science”, NarsinghDeo, Prentice-Hall, 2004. |
| **Reference Books:** | |
| 1. | “Network Flows: Theory, Algorithms, and Applications”, R. Ahuja, T. Magnanti, and J. Orlin, Prentice Hall. |
| 2. | “Graph Theory”, Frank Harary, Narosa, 2002. |

3. “Introduction to Graph Theory”, Douglas B. West, Prentice Hall of India, 2000.

4. “Graph Theory with Applications to Engineering and Computer Science”, NarsinghDeo, Prentice-Hall, 2004.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Solve** problems using basic graph theory | **PO1,PO2,PO12,PO7** |
| **CO2** | **Identify** induced subgraphs, cliques, matchings, covers in graphs | **PO1,PO2,PO12,PO3** |
| **CO3** | **Determine** whether graphs are Hamiltonian and/or Eulerian | **PO1,PO2,PO12PO6** |
| **CO4** | **Solve** problems involving vertex and edge connectivity, planarity and crossing numbers | **PO1,PO2,PO12,PO3** |
| **CO5** | **Solve** problems involving vertex and edge coloring and modelling real world problems using graph theory | **PO1,PO2,PO12,PO6** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61115 | Advanced Graph Theory(Elective –III) | 3 | 3 | 2 | - | - | 2 | 1 | - | - | - | - | 3 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

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| **Name:**  **Enrolment No:** | |  | | |
| **ADAMAS UNIVERSITY**  **SCHOOL OF ENGINEERING AND TECHNOLOGY**  **END-SEMESTER EXAMINATION**  **Name of the Program: M.Tech Semester: I**  **Code- ECS61115 Stream- CSE Time: 03 Hrs.**  **Paper title– Advanced Graph Theory Total pages- 2**  **Max. Marks: 40**  **Total no. of questions- 12**  **Instructions:**  Attempt All Questions from **Section A** (Each Carrying 1 Marks); any **Three Questions** from **Section B** (Each Carrying 5 Marks)**.** Any **Two Questions from Section C** (Each Carrying 10 Marks)**.**  1. **At top of sheet, clearly mention Name, Roll No., Enrolment No., Paper Name & Code, and Date of Exam.**  2. **Assumptions made if any, should be stated clearly at the beginning of your answer.**  3. **All parts of a Question should be answered consecutively.** | | | | |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | | |
| 1. | **Prove** that the number of vertices in a simple connected graph with odd degree is even. | | **Ap** | **CO2** |
| 2. | **Draw** a simple graph that is eulerian but not Hamiltonian. | | **R** | **CO3** |
| ­­­ 3. | **Explain** circulant graph with example. | | **R** | **CO1** |
| 4. | **What** is a symmetric graph? | | **U** | **CO4** |
| 5. | **Explain** Perfect matching with example. | | **R** | **CO5** |
| **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** | | | | |
| 6. | **Identify** greedy algorithm | | **Ap** | **CO2** |
| 7. | **Compare** direct paths and cycle | | **An** | **CO3** |
| 8. | **Analyze** Traveling Salesman Problem | | **An** | **CO3** |
| 9. | **Distinguish** Turen’s with Example | | **An** | **CO3** |
| **SECTION (Answer Any Two Questions) (2 x 10 = 20)** | | | | |
| 10. | **Prove** that a graph of *n* vertices is a complete graph if its chromatic  polynomials Pn(λ) = λ (λ – 1) (λ – 2) … (λ - n + 1) | | **E** | **CO3** |
| 11. | **Solve** the recurrence relation. 6an-7an-1=0, n≥1, a3=343. | | **Ap** | **CO1** |
| 12. | **List** some types of digraph with suitable example | | **R** | **CO4** |

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| **ECS61127** | **VLSI Design (Elective -III)** | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hour-45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Discrete Mathematics** | | | | |
| **Co-requisites** | 1. Understanding of Electronic Devices  2. Understanding of Analog Electronics | | | | |

**Course Objectives:**

* To help to understand the functionality of VLSI design.
* To familiar with different types of VLSI fabrication technology
* To study the characteristics of MOSFETs.
* To explain the use of MOS and CMOS Circuits
* To acquire the knowledge of CMOS logic circuit.
* To able to design semiconductor memories.

**Course Outcomes:**

On completion of this course, the students will be able to

**CO1. Utilize** the basic design principles of VLSI.

**CO2. Develop** the concept of the different fabrication techniques.

**CO3. Summarize** the concept of Metal Oxide Field Effect Transistors.

**CO4. Relate** with the basics of MOS and CMOS circuit design.

**CO5. Illustrate** and design CMOS logic circuits.

**CO6. Appraise** the necessities of memory devices and able to design various types

of semiconductor memories.

**Catalog Description:**

**Very large-scale integration** (**VLSI**) is the process of creating an integrated circuit (IC) by combining millions of MOS transistors onto a single chip. VLSI began in the 1970s when MOS integrated circuit chips were widely adopted, enabling complex semiconductor and telecommunication technologies to be developed. The microprocessor and memory chips are VLSI devices. Before the introduction of VLSI technology, most ICs had a limited set of functions they could perform. An electronic circuit might consist of a CPU, ROM, RAM and other glue logic. VLSI lets IC designers add all of these into one chip.

**Course Content:**

**Unit I: 9 lecture hours**

**Introduction to VLSI Design:**

Historical Perspective and Future Trends, Moor’s Law;Scale of Integration (SSI, MSI, LSI, VLSI, ULSI), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioural, Structural ); VLSI design styles: Full custom, Gate array, Standard cell, Micro-cell based design, Field programmable device; Design quality.

**Unit II: 7 lecture hours**

**Fabrication Technology**

Si semiconductor technology: Wafer preparation, Oxidation, Ion implantation, Different deposition processes, Metallization, Etching, Lithography; Bipolar, CMOS and Bi-CMOS fabrication processes; Layout design rule.

**Unit III: 7 lecture hours**

**MOSFET**

MOSFET characteristics threshold voltages, body effect, Chanel length modulation, MOSFET scaling, MOS switch and inverter, the complementary CMOS inverter-DC characteristic, Alternate CMOS inverter, latch up.

**Unit IV: 7 lecture hours**

**MOS & CMOS Circuit Characterization and Performance Estimation**

Resistance Estimation, Capacitance Estimation: MOS Device Capacitance, Diffusion Capacitance, Routing Capacitance, RC Effects, Capacitance Design Guide; Switching Characteristic: Fall Time, Rise Time, Delay Time; RC Circuit Delay Computation: Cascaded RC Stages, Elmore Delay. Propagation Delay Calculation with Elmore Model for Multiple RC Stages; CMOS Gate Transistor Sizing, Determination of Conductor Size, Power Consumptions: Static Dissipation, Dynamic Dissipation.

**Unit V: 8 lecture hours**

**CMOS circuit and logic design**

CMOS logic circuit, NMOS and CMOS Logic, Dynamic and Pass-transistor logic, Design of logic gate: Inverter, NAND and NOR gate, CMOS Full Adder ,Multiplexer, Decoder, logic minimization, Advanced CMOS Logic circuits; Sequential CMOS logic circuits; SR Latch circuit, clocked JK Latch/ Master-Slave JK , CMOS D-latch & Edge triggered flip-flop , Series and parallel transistor connection, source drain capacitance, charge sharing, Logic style comparison, Physical layout logic gate, CMOS standard cell design, Layout and layout design rules.

**Unit VI: 7 lecture hours**

**Semiconductor memories**

SRAM: CMOS SRAM cell, Bipolar SRAM cell; DRAM: basic DRAM cell and its Operation Device design and scaling Considerations for a DRAM Cell; Non-volatile memories: MOSFET nonvolatile memory devices, Flash Memory Arrays, Floating-Gate Nonvolatile Memory Cells, Nonvolatile Memory Cells with Charge Stored in Insulator

**Text Books:**

1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education,2nd edition 2003
2. Weste and Eshrighian, ―Principle of CMOS VLSI Design‖ Pearson Education

**Reference Books:**

1. Wayne, Walf, “Modern VLSI design: System on Silicon” Pearson Education, 2nd Edition, 1998.
2. Pucknull, “Basic VLSI Design” PHI 3rd Edition

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Class Assessment** | **Mid Term** | **End Term** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and Pos** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Utilize** the basic design principles of VLSI. | **PO1, PO2, PO3** |
| **CO2** | **Develop** the concept of the different fabrication techniques. | **PO1, PO2, PO3, PO4,PO12** |
| **CO3** | **Summarize** the concept of Metal Oxide Field Effect Transistors. | **PO1, PO2, PO3, PO4, PO5,PO6, PO12** |
| **CO4** | **Relate** with the basics of MOS and CMOS circuit design. | **PO1,PO2, PO3, PO4,PO5, PO6** |
| **CO5** | **Illustrate** and design CMOS logic circuits. | **PO1, PO2, PO3, PO4, PO5, PO12** |
| **CO6** | **Appraise** the necessities of memory devices and able to design various types of semiconductor memories. | **PO1, PO2, PO3, PO4, PO5, PO6, PO12** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| EEC61127 | VLSI Design(Elective –III) | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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| --- | --- | --- | --- | --- |
| **Name:**  **Enrolment No:** | |  | | |
| **Course: EEC61127 – VLSI Design (Elective –III)** **Program: M.Tech. (CSE) Semester: I**  **Time: 03 hrs. Max. Marks:40**  **Instructions:**  Attempt all the questions from **Section A** (each carrying 1 marks); any **Three Questions** from **Section B** (each carrying 5 marks)**.** any **Two Questions** from **Section C** is Compulsory (carrying 10 marks)**.** | | | | | |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | | | |
| 1. | **State**Moor’s Law; Scale of Integration in VLSI design. (R) | | **[1]** | **CO1** | |
| 2. | **What** do you mean by ASIC? (U) | | **[1]** | **CO1** | |
| ­­­ 3. | **Write** down the applications of Chanel length modulation. (U) | | **[1]** | **CO3** | |
| 4. | **Where** Elmore Model is used? (U) | | **[1]** | **CO4** | |
| 5. | In the circuit shown, **what** are the values of F for EN= 0 and EN= 1 respectively (Ap) | | **[1]** | **CO5** | |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** | |  |  | |
| 6. | **Write** a short note on Full custom design. (U) | | **[5]** | **CO1** | |
| 7. | **Write** down the mathematical analysis of Capacitance Estimation in MOS. (U) | | **[5]** | **CO4** | |
| ­­­ 8. | **Write** down the fabrication processes of CMOS. (U) | | **[5]** | **CO2** | |
| 9. | **What** are the applications of body effect of MOS transistor? (U) | | **[5]** | **CO3** | |
|  | **SECTION C (**Attempt any **two Question) (2 x 10 = 20)** | |  |  | |
| 10. | **Design**Master-Slave JK filp flop. (U) | | **[10]** | **CO5** | |
| 11. | **Calculate** the dynamic power dissipation of CMOS inverter. (Ap) | | **[10]** | **CO4** | |
| 12. | a) **Compare** between static logic and dynamic logic. Explain the operation of Domino logic to design CMOS circuits. What are the limitations of it? (U)  b) **Write** down the operation of NORA logic. (U) | | **[6+4]** | **CO5** | |

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| **EEC61129** | **Mobile Computing (Elective -III)** | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hour -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | Fundamentals of Digital Communication, Data Communication, and Wireless Communication | | | | |
| **Co-requisites** | FDM, TDM, Modulation | | | | |

**Course Objectives:**

* To investigate the algorithm/protocols, environments and communication systems in mobile computing.
* To enable students to enlist the components of GSM, GPRS, and Bluetooth software model for mobile computing.
* To explain the importance of MAC protocols.
* To compare protocols based on wireless local area networks, cellular networks etc.
* To enable the students for acquiring the fundamental knowledge of switching, routing, congestion control and security issues related to a network.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1**.Understand** algorithm/protocols, environments and communication systems in mobile computing

CO2**.Understand** and identify the GSM, GPRS and Bluetooth software model for mobile computing.

CO3**. Analyze** the performance of MAC protocols used for wired network and wireless networks.

CO4**. Illustrate** the concepts, techniques, protocols and architecture employed in wireless local area networks, cellular networks, and performs basic requirements analysis.]

CO5**. Apply** techniques and technologies to design and communicate a simple mobile application for smaller devices.

CO6**. Design** and **analyze** the existing routing protocols for multi-hop wireless networks.

**Catalog Description:**

With the increasing popularity of mobile devices, mobile computing has become part of our daily life. This course will cover various topics of mobile computing, networking, and systems, including but not limited to: applications of smartphones, cellular networks, embedded sensor systems, localization systems, energy efficiency of mobile devices, wearable and vehicular mobile systems, mobile security, virtual reality and augmented reality. We will discuss research papers from top conferences, brainstorm cool ideas, and build real mobile systems through team projects.

**Course Content:**

**Module 1: Introduction 11 lecture hours**

Introduction to mobile computing, basics of digital communication and computer networks, Convergence of Internet. Overview of Global System for Mobile Communication (GSM) system: GSM Architecture, Mobility management, Overview of General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Sharing of wireless channels: FDMA, TDMA, and CDMA. MAC layer issues in wireless communication.

**Module 2: Computational Model and algorithm 08 lecture hours**

Influence of portability and mobility in computational model and algorithms for mobile environment. Handling handoffs, disconnected operation. Analysis of algorithms and termination detection.

**Module 3: Mobility in cellular based wireless network: 11 lecture hours**

Different types of Mobility, channel allocation, interferences, handoffs, Frequency reuse and location management. IP mobility: Mobile IP and IDMP, Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. Wireless LAN, Personal Area Network: Bluetooth Wi-Max, Wi-Fi and ZigBee, Familiarization with UWB, LTE, EDGE & MIMO Technologies

**Module 4: Data delivery models in wireless channel 8 lecture hours**

push based mechanism and pull based mechanism. Data distribution or dissemination in wireless channels. Broadcast disks. Caching effects.

**Module 5: Ad Hoc and Sensor Networks: 7 lecture hours**

Introduction, Protocols Challenges. Indexing in Air, Mobile Databases, Distributed file system for mobile environment.

**Text Books:**

1.Wireless Communications and Networking, Willam Stallings, Pearson Education. (2002) W Stallings, “Data and Computer Communication” –7/e Pearson

2.Wireless Communication: Principles and Practice, T. Rappaport, Pearson Education.

**Reference Books:**

1.Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press

2.ochen Schiller, "Mobile Communications", 2nd Edition, Addison-Wesley (An imprint of Pearson Education), 2003.

3.R. Dayem, "Mobile Data & Wireless Lan Technologies," Prentice-Hall (2005)

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Understand** algorithm/protocols, environments and communication systems in mobile computing | **PO1, PO2** |
| **CO2** | **Understand** and identify the GSM, GPRS and Bluetooth software model for mobile computing. | **PO2, PO3** |
| **CO3** | **Analyze** the performance of MAC protocols used for wired network and wireless networks. | **PO3, PO4, PO5** |
| **CO4** | I**llustrate** the concepts, techniques, protocols and architecture employed in wireless local area networks, cellular networks, and performs basic requirements analysis. | **PO1, PO2, PO3, PO5** |
| **CO5** | **Apply** techniques and technologies to design and communicate a simple mobile application for smaller devices. | **PO1, PO2, PO3, PO6, PO5** |
| **CO6** | **Design** and analyze the existing routing protocols for multi-hop wireless networks. | **PO1, PO2,** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual and team work | Communication | Project management and finance | Life-long Learning | |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| EEC  61129 | Mobile Computing(Elective –III) | 3 | 3 | 3 | 1 | 3 | 1 | - | - | - | - | - | - |

1=weakly mapped 2= moderately mapped 3=strongly mapped

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| --- | --- | --- | --- | --- |
| **Name:**  **Enrolment No:** | |  | | |
| **Course: EEC61129 – Mobile Computing (Elective –III)** **Program: M.Tech (CSE) Semester: I**  **Time: 03 hrs. Max. Marks:40**  **Instructions:**  Attempt all the questions from **Section A** (each carrying 1 marks); any **Three Questions** from **Section B** (each carrying 5 marks)**.** Any **Two Questions** from **Section C** is Compulsory (carrying 15 marks)**.** | | | | | |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | | | |
| 1. | **Explain** Shannon’s and Nyquist theorem with suitable equations*.* | | **U**  **R** | **CO1** | |
| 2. | **What** should be done to find the nearest co-channel cell to a specific cell? | | **R** | **CO1** | |
| ­­­ 3. | **Explain** the applications of Ad Hoc networks. | | **U** | **CO2** | |
| 4. | **Explain** Push based mechanism. | | **U** | **CO2** | |
| 5. | **Compare** Mobile IP with Ip used for computer networks with suitable examples. | | **An** | **CO3** | |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** | |  |  | |
| 6. | **Explain** WAP architecture with the aid of suitable block diagram. **Compare** WAP protocol stack with OSI protocol stack. | | **R**  **An** | **CO1**  **CO3** | |
| 7. | **Explain**the significance of frequency reuse in enhancing capacity of a cellular network with proper mathematical equations and assumptions. | | **U** | **CO2** | |
| ­­­ 8. | **Differentiate** MANETS from VANETS using suitable comparison table. Explain the components of VANET’s. **Name** the technology which supports multi-hop communication between vehicles. | | **An**  **R** | **CO3**  **CO1** | |
| 9. | **What** are the three databases present in the network and switching sub-system (NSS) of the GSM architecture? **Explain** the significance of each data base in brief. | | **R**  **U** | **CO2** | |
|  | **SECTION C (**Attempt any **two Question) (2 x 10 = 20)** | |  |  | |
| 10. | **Explain** Why the shape of a cell is chosen to be a hexagon? **What** is handoff? **What** is the difference between hard handoff and soft handoff? Justify the statement “The margin given by Δ= Pr handoff – Pr minimum usable, cannot be too large or too small.” | | **U**  **An** | **CO2**  **CO3** | |
| 11. | Suppose a mobile unit transmits 10 W power at Adamas University. This power when expressed in terms of dBm is equal to \_\_\_\_\_\_\_dBm.  **Explain** some major applications of wireless sensor networks. Explain the constraints in Ad-Hoc networks. | | **An**  **Ap** | **CO3**  **CO5** | |
| 12. | **Explain** fixed routing algorithm with the help of suitable example. **Compare** WAP protocol stack with TCP/IP protocol stack. | | **U**  **An** | **CO2**  **CO3** | |

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| **ECS61301** | Seminar -I | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hour -30** | **0** | **2** | **0** | **2** |
| **Pre-requisites/Exposure** | **Knowledge on Computer domain** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To **develop** skills in doing literature survey, technical presentation and report preparation.
* To **enable** project identification and execution of preliminary works on final semester project

**Course Outcomes**

On completion of this course, the students will be able to

CO1. **Identify** the advanced technologies and globalization

CO2. **Develop** communication and representation skills towards becoming a good team leader and

manager

CO3. **Plan** for lifelong learning towards industry readiness

CO4. **Build** the ability to identify an engineering problem, analyze it and propose a work plan to

solve it.

**Catalog Description:**

The course involves presentation and report submission by every student. Reference search and technical writing skills along with effective presentation skills are focused. The course strengthens the research attributes including literature survey.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

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| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Identify** the advanced technologies and globalization | **PO1, PO2, PO3** |
| **CO2** | **Develop** communication and representation skills towards becoming a good team leader and manager | **PO9, PO10** |
| **CO3** | **Plan** for lifelong learning towards industry readiness | **PO1, PO12** |
| **CO4** | **Build** the ability to identify an engineering problem, analyze it and propose a work plan to solve it. | **PO1, PO2, PO3, PO4, PO5, PO6** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61301 | Seminar -I | 3 | 2 | 2 | 1 | 1 | 1 | 1 | - | 1 | 1 | - | 1 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

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| **ECS61201** | **Computing Lab –I** | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hour -45** | **0** | **0** | **3** | **2** |
| **Pre-requisites/Exposure** | **C Programming** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To formulate and evaluate a hypothesis by proposing, implementing and testing a project.
* To relate one project to prior research via a review of related literature.
* To understand the fundamental questions in parallel and distributed computing and analyse different solutions to these questions.
* To understand different parallel and distributed programming paradigms and algorithms, and gain practice in implementing and testing solutions using these.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Build**a communication between two sockets over a network.

CO2. **Apply**the basic concept of python programming and to **construct**a real-life application.

CO3. **Develop**a client server communication between multiple computing systems.

CO4. **Examine**different library and tools associated with python.

**Catalog Description:**

This course covers the architecture and enabling technologies of parallel and distributed computing systems and their innovative applications. We will cover scalable multiprocessors,

distributed clusters, P2P networks, computational Grids, virtual machines, and Internet Clouds. Case studies include IBM Blue Gene/L, Google search-engine, Tera Grid, e-Science, DataGrid, Gnuttela, BitTorrent, content-delivery networks, VM Monitors, IBM Blue Cloud, Amazon Elastic Clouds, Google Clouds, etc. The course aims to acquaint Master and Ph.D. students in computer science, electrical and computer engineering with state-of-the-art supercomputers and distributed computing systems for high-performance computing, e-commerce, and web-scale Internet applications.

**Course Content:**

**Experiment 1:**

Familiar Socket programming.

**Experiment 2:**

Database creation and update.

**Experiment 3:**

Building large client server applications.

**Experiment 4:**

Basics of compiler writing using lex and yacc.

**Experiment 5:**

Introduction to python Object, varibles and data types.

**Experiment 6:**

Introduction to duck typing, equality vs. identity testing.

**Experiment 7:**

Introduction to Additional useful string methods

**Experiment 8:**

String formatting, running Python as a script

**Experiment 9:**

The basics of imports, Data Structures, Functions, Functional Programming

**Experiment 10:**

Object-Oriented Python, Standard Library, Third-Party Tools.

**Text Books:**

1. “Python Cookbook: Recipes for Mastering Python 3” by Brian K. Jones and David M. Beazley.

**Reference Books:**

1. “Programming Python” by Mark Lutz.
2. “How to think like a computer scientist: Learning with Python” by Allen B. Downey.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (Cos) and Program Outcomes (Pos)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and Pos** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Build** communication between two sockets over a network. | **PO1, PO2, PO3** |
| **CO2** | **Apply** the basic concept of python programming and to **construct** real-life application. | **PO1, PO2, PO3** |
| **CO3** | **Develop** client server communication between multiple computing systems. | **PO4,PO6** |
| **CO4** | **Examine** different library and tools associated with python. | **PO5** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61201 | Computing Lab –I | 2 | 2 | 2 | 1 | 1 | 1 | - | - | - | - | - | - |

1=weakly mapped2= moderately mapped3=strongly mapped

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: I Stream: CSE

PAPER TITLE: Computing Lab –I

PAPER CODE: ECS61201

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 5 Total No of Pages: 02

**Instruction for the Candidate:**

1.At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.

2.All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.

3.Assumptions made if any, should be stated clearly at the beginning of your answer.

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| **Section A (Answer All the Questions) (5 x 8 = 40)** | | | |
| 1. | **Develop** a Chat program between to computing facility using python? | **AP** | **CO2** |
| 2. | **Develop** the following program.  There's a staircase with N steps, and you can climb 1 or 2 steps at a time. Given N, write a function that returns the number of unique ways you can climb the staircase. The order of the steps matters.  For example, if N is 4, then there are 5 unique ways:  1, 1, 1, 1  2, 1, 1  1, 2, 1  1, 1, 2  2, 2  What if, instead of being able to climb 1 or 2 steps at a time, you could climb any number from a set of positive integers X? For example, if X = {1, 3, 5}, you could climb 1, 3, or 5 steps at a time. Generalize your function to take in X. | **AP** | **CO4** |
| ­­­ 3. | **Develop** the following program  “I am not in danger, Skyler. I am the danger. A guy opens his door and gets shot, and you think that of me? No! I am the one who knocks!”  Skyler fears Walter and ponders escaping to Colorado. Walter wants to clean his lab as soon as possible and then go back home to his wife.  In order clean his lab, he has to achieve cleaning level of lab as Y. The current cleaning level of the lab is X.  He must choose one positive odd integer a and one positive even integer b. Note that, he cannot change a or b once he starts cleaning.  He can perform any one of the following operations for one round of cleaning:  Replace X with X+a.  Replace X with X−b.  Find minimum number of rounds (possibly zero) to make lab clean. Input:  * First line will contain TT, number of test cases. TT testcases follow : * Each test case contains two space separated integers X,YX,Y.  Output: For each test case, output an integer denoting minimum number of rounds to clean the lab. Constraints  * 1≤T≤1051≤T≤105 * |X|,|Y|≤109|X|,|Y|≤109  Sample Input: 3  0 5  4 -5  0 10000001 Sample Output: 1  2  1 | **AP** | **CO3** |
| 4. | **Develop** the following program  Princess Rupsa saw one of her friends playing a special game. The game goes as follows:   * **N+1** numbers occur sequentially (one at a time) from **A0** to **AN**. * You must write the numbers on a sheet of paper, such that **A0** is written first. The other numbers are written according to an inductive rule — after **Ai-1**numbers have been written in a row, then **Ai** can be written at either end of the row. That is, you first write **A0**, and then **A1** can be written on its left or right to make **A0A1** or **A1A0**, and so on. * **Ai** must be written before writing **Aj**, for every **i< j**. * For a move in which you write a number **Ai (i>0)**, your points increase by the product of **Ai** and its neighbour. (Note that for any move it will have only one neighbour as you write the number at an end). * Total score of a game is the score you attain after placing all the **N + 1**numbers.   Princess Rupsa wants to find out the sum of scores obtained by all possible different gameplays. Two gameplays are different, if after writing down all **N + 1**numbers, when we read from left to right, there exists some position **i**, at which the gameplays have **aj** and **ak** written at the **ith** position such that **j ≠ k**. But since she has recently found her true love, a frog Prince, and is in a hurry to meet him, you must help her solve the problem as fast as possible. Since the answer can be very large, print the answer modulo **109 + 7**. Input  * The first line of the input contains an integer **T** denoting the number of test cases. * The first line of each test case contains a single integer **N**. * The second line contains **N + 1** space-separated integers denoting **A0** to **AN**.  Output  * For each test case, output a single line containing an integer denoting the answer.  Constraints  * **1** ≤ **T** ≤ **10** * **1** ≤ **N** ≤ **105** * **1** ≤ **Ai** ≤ **109**  Sub tasks  * Subtask #1: 1 ≤ **N** ≤ 10 (10 points) * Subtask #2: 1 ≤ **N** ≤ 1000 (20 points) * Subtask #3: Original Constraints (70 points)  Example **Input:**  2  1  1 2  2  1 2 1  **Output:**  4  14 | **AP** | **CO1** |
| 5. | **Develop** the following program  2 Milkmen Aditya and Rahul were doing very good business in their village as partners and had many milk containers of the following sizes.  The codes for each of the sizes are given in the braces they are supposed to be entered in the input as specified in INPUT section.  Can (CN) 10 gallons  Pail (PL) 2 gallons  Gallon (G)  Quart (Q) 1/4 gallon  Pint (PN) 1/8 gallon  Cup (CP) 1/16 gallon  Now Rohan who lives in the same village took up a assignment to know in how many ways can the milkmen store X gallons of milk using any combination of these containers. For instance, the milkmen can store one Quart four ways:  1: 1 quart  2: 2 pints  3: 1 pint + 2 cups  4: 4 cups  One gallon can be stored 26 different ways.  In all data, X is a positive integer number and 1 <= X gallons <= 50. Rohans program must compute the number of combinations for each separate input value in less than ten seconds (which means that your program might run as long as 10\*n seconds for n input values). Input Your program should read values from the file first the Quantity and then followed by the code for each of the sizes as specified above in the second line (and compute and print the number of combinations) until encountering a value of #. Output Your output should give the number of ways specified for the input.  An example is given below:  **Sample Input**  1  G  #  **Sample Output**  26 | **AP** | **CO2** |

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|  | **& Distributed Computing** | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours -60** | **3** | **1** | **0** | **4** |
| **Pre-requisites/Exposure** | **Java, Computer Networking, Operating systems** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

1. To fformulate and evaluate a hypothesis by proposing, implementing and testing a project.

2. To relate one project to prior research via a review of related literature.

3. To understand the fundamental questions in parallel and distributed computing and analyze different solutions to these questions.

4. To understand different parallel and distributed programming paradigms and algorithms, and gain practice in implementing and testing solutions using these.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Apply** the fundamentals of parallel and distributed computing including parallel architectures and paradigms.

CO2. **Apply** parallel algorithms and key technologies.

CO3. **Develop** and execute basic parallel and distributed applications using basic programming models and tools.

CO4. **Analyze** the performance issues in parallel computing and trade-offs.

**Catalog Description:**

This course covers the architecture and enabling technologies of parallel and distributed computing systems and their innovative applications. We will cover scalable multiprocessors,

distributed clusters, P2P networks, computational Grids, virtual machines, and Internet Clouds. Case studies include IBM BlueGene/L, Google search-engine, TeraGrid, e-Science, DataGrid, Gnuttela, BitTorrent, content-delivery networks, VM Monitors, IBM BlueCloud, Amazon Elastic Clouds, Google Clouds, etc. The course aims to acquaint Master and Ph.D. students in computer science, electrical and computer engineering with state-of-the-art supercomputers and distributed computing systems for high-performance computing, e-commerce, and web-scale Internet applications.

**Course Content:**

**Unit I: 10 lecture hours**

Characterization of Distributed Systems- Introduction, Examples of distributed systems, Resource sharing and the Web Challenges, System Models- Architectural models, Fundamental Models Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport’s& vectors logical clocks, Causal ordering of messages, global state, termination detection.

**Unit II: 12 lecture hours**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms

**Unit III: 14 lecture hours**

Agreement Protocols- Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Objects and Remote Invocation- Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study. Distributed Shared Memory-Architecture and motivations. Algorithms for implementing DSM. Memory Coherence.

**Unit IV: 13 lecture hours**

Security- Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies- N eedham Schroeder, Kerberos, SSL and Millicent. Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances, Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

**Unit V: 11 lecture hours**

Distributed Algorithms- Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave and traversal algorithms, Election algorithm CORBA Case Study- CORBA RMI, CORBA services.

**Text Books:**

1. "Distributed System: Concepts and Design”, Coulouris, Dollimore, Kindberg, Pearson Education.

**Reference Books:**

1. “Advanced Concept in Operating Systems", Singhal&Shivaratri, McGraw Hill

2. "Distributed Algorithms", Gerald Tel, Cambridge University

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and PPOs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Apply** the fundamentals of parallel and distributed computing including parallel architectures and paradigms. | **PO1,PO12** |
| **CO2** | **Apply** parallel algorithms and key technologies. | **PO1, PO2,PO3,PO5** |
| **CO3** | **Develop** and execute basic parallel and distributed applications using basic programming models and tools. | **PO1, PO4,PO5,PO6** |
| **CO4** | **Analyze** the performance issues in parallel computing and trade-offs. | **PO4,PO2** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  61102 | Parallel & Distributed Computing | 3 | 2 | 1 | 2 | 2 | 1 | - | - | - | - | - | 1 |

1=weakly mapped 2= moderately mapped 3=strongly mapped

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Parallel & Distributed Computing

PAPER CODE: ECS61102

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 11 Total No of Pages: 02

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Define** distributed system? | **R** | **CO4** |
| 2. | **Explain** effective resource sharing? | **U** | **CO2** |
| ­­­ 3. | **Identify** the challenges of the distributed systems? | **Ap** | **CO1** |
| 4. | **Explain** distributed deadlock detection? | **U** | **CO3** |
| 5. | **Explain** TCP Stream communication? | **U** | **CO3** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Explain** UDP datagram communication in detail? | **U** | **CO2** |
| 7. | **Explain** the API for the internet protocols in IPC? | **U** | **CO3** |
| **8.** | **Describe** in detail about Andrew file system? | **U** | **CO4** |
| 9. | **Write** a brief note on nested transactions? | **R** | **CO1** |
|  | **SECTION (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Explain** sun network file system?**Explain** file service architecture in detail? 5+5 | **U** | **CO3** |
| 11. | **Explain** in detail about external data and marshalling?**Explain** client-server communication in detail? 5+5 | **U** | **CO2** |
| 12. | **Explain** global states in detail?**Describe** distribute debugging? 5+5 | **R** | **CO4** |

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| **ECS61104** | Advance Database System (Elective -IV) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hour -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Knowledge of Database Management System.** | | | | |
| **Co-requisites** | **-** | | | | |

**Course Objectives:**

* To introduc**e** the students in depth information about system implementation techniques, data storage, representing data elements, database system architecture.
* To provide the concept of system catalogue, query processing and optimization transaction processing concepts, concurrency control techniques.
* To develop the concept on database recovery techniques, database security and authorization.
* To introduce enhanced data models for advanced applications, temporal databases, deductive databases.
* To develop idea on database technology for decision support systems, distributed databases and client server architecture.
* To introduce with advanced database concepts, and emerging technologies and applications.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Define** the concepts of relational database system

CO2. **Build** the concepts in parallel databases

CO3. **Develop** the design issues in object-oriented databases.

CO4. **Solve** the concepts of distributed databases.

CO5. **Examine** various database architecture and issues in authentication and security.

**Catalog Description:**

This module builds on the introductory module in databases. It intends to introduce more advanced topics in databases such as data mining and data warehousing, distributed databases and client server architecture after introducing the DBMS implementation. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, as per requirement. The tutorials will familiarize the students with practical problem-solving techniques led by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinator.

**Course Content:**

**Unit-I 10 Lecture Hours**

**Data Base Analysis and Design Techniques**- Review of basic Database Concepts, Database Design Methodologies. ER Modeling: Specialization, Generalization, Aggregation, Normalization Theory. Database Implementation using UML- Introduction to UML, Structure diagrams, behavioral diagrams, object oriented analysis, class diagram.

Advanced Transaction Processing and Concurrency Control- Transaction Concepts, Concurrency Control- Locking Methods, Time stamping Methods, Optimistic Methods for Concurrency Control, Concurrency Control in Distributed Systems

**Unit II: 10 Lecture Hours**

**Query Compiler:** Introduction, parsing, generating logical query plan from parse tree. Query Processing: Physical Query plan Operators. Operations- selection, sorting, join, project, set. Query Evaluation: Introduction, Approaches to QE, Transformation of relational expressions in Query optimization, heuristic optimization, cost estimation for various operations, transformation rule.

**Unit III: 10 Lecture Hours**

**Distributed Database-** Centralized DBMS and Distributed DBMS, functions and architecture of a DDBMS, Distributed Data Storage, Transparency issues in DDBMS, Query Processing DDBMS, Distributed transaction Management and Protocols, Distributed Concurrency Control and Deadlock Management.

Object Oriented Database Limitations of RDBMS, Need of Complex Data type, Data Definition, ODBMS Fundamentals, issues in OODBMS, Object oriented database design. Comparison of ORDBMS and OODBMS

**Unit IV: 10 Lecture Hours**

Emerging Database Models, Technologies and Applications Multimedia database Emergence, difference from other data types, structure, deductive databases, GIS and spatial databases, Knowledge database, Information Visualization, Wireless Networks and databases, Personal database, Digital libraries, web databases, case studies.

**Unit V: 5 Lecture Hours**

**Data Warehousing:** Introduction, basis concepts, data warehouse architecture, data characteristics, reconciled data layer, data transformation, derived data layer, user interface.

**Authentication and Security –** Authentication and Access, DAC, MAC, RBAC, ABAC

SQL Injection Problem, Intrusion Detection and Recovery

**Text Books:**

1. “Database System Concepts”, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Tata McGraw-Hill.
2. “Advanced database management system”,RiniChkrabarti and ShibhadraDasgupta, Dreamtech.

**Reference Books:**

1. **“**Fundamentals of Database Systems”RamezElmasri, ShamkantNavathe, Pearson Education
2. “Distributed Databases” Ozsu and Valduriez ,Pearson Education

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Class Assessment** | **Mid Term** | **End Term** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Define** the concepts of relational database system | **PO1, PO2** |
| **CO2** | **Build** the concepts in parallel databases | **PO1, PO2, PO4** |
| **CO3** | **Develop** the design issues in object-oriented databases. | **PO1, PO2** |
| **CO4** | **Solve** the concepts of distributed databases. | **PO1, PO2** |
| **CO5** | **Examine** various database architecture and issues in authentication and security. | **PO1, PO2, PO5** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61104 | Advance Database System (Elective -IV) | 3 | 3 | - | 1 | 1 | - | - | - | - | - | - | - |

1=weakly mapped

2= moderately mapped

3=strongly mapped

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Advance database System (Elective -IV)

PAPER CODE: ECS61104

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 02

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (**Answer **All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Classify** dynamic query. | **U** | **CO1** |
| 2. | **Justify** how relational model differs from network model? | **Evaluate** | **CO1** |
| ­­­3. | **Summarize** any four familiar Data Mining techniques. | **U** | **CO2** |
| 4. | **What** is SQL injection? And **how** to prevent it? | **R** | **CO2** |
| 5. | **What** are the advantages of data warehouse? | **R** | **CO2** |
| **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** | | | |
| 6. | **Explain** the concept of encapsulation, and tell how it is used to create abstract data types? | **U** | **CO3** |
| 7. | **What** is a transaction? **Classify** the properties of that must be satisfied by a transaction. | **R, Ap** | **CO4** |
| 8. | **Interpret** in detail Two-phase locking techniques for concurrency control. | **U** | **CO2** |
| 9. | **Outline** Multivalued Dependency | **U** | **CO1** |
| **SECTION C (**Attempt Any **Two Questions) (2 x 10 = 20)** | | | |
| 10. | **Identify** the challenges and issues in database security design? | **Ap** | **CO5** |
| 11. | **List** all the issues of transaction management in object-oriented database. | **R** | **CO3** |
| 12. | **Analyze** are the challenges and issues in database security design? | **Analyze** | **CO5** |

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| **ECS61106** | **Cloud Computing (Elective -IV)** | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours-45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **DBMS, Java, Python, Computer Networking** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
* To apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost by Load balancing approach.
* To discuss system virtualization and outline its role in enabling the cloud computing system model.
* To analyze various cloud programming models and apply them to solve problems on the cloud.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Identify** the appropriate cloud services for a given application.

CO2. **Assess** the comparative advantages and disadvantages of Virtualization technology.

CO3. **Analyze** authentication, confidentiality and privacy issues in cloud computing.

CO4. **Identify** security implications in cloud computing.

CO5. **Understand** the importance of protocols and standards in management for cloud services.

**Catalog Description:**

This course provides a comprehensive study of Cloud concepts and capabilities across thevarious Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS),Software as a Service (SaaS). It consists of topics like cloud service models, virtualization and cloud infrastructure, and security and management of cloud.

**Course Content:**

**Unit I: 10 lecture hours**

Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS, service oriented computing and cloud environment.

**Unit II: 8 lecture hours**

Client systems, Networks, server systems and security from services perspectives, Accessing the cloud with platforms and applications, cloud storage.

**Unit III: 12 lecture hours**

Working with Cloud- Infrastructure as a Service: conceptual model and working Platform as a Service: conceptual model and functionalities Software as a Service: conceptual model and working Technologies and Trends in Service provisioning with clouds.

**Unit IV: 15 lecture hours**

Using Cloud Services- Cloud collaborative applications and services – technology, applications and case studies with calendars, schedulers and event management; cloud applications in project management.

**Text Books:**

1. “Cloud Computing – A Practical Approach”, AnthonyT.Velte, Toby J.Velte and Robert E, TMH , 2010.

**Reference Books:**

1. “Cloud Computing – Web based Applications”, Michael Miller, Pearson Publishing, 2011.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (Cos) and Program Outcomes (Pos)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and Pos** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Identify** the appropriate cloud services for a given application. | **PO1,PO12** |
| **CO2** | **Assess** the comparative advantages and disadvantages of Virtualization technology. | **PO2,PO3,PO5** |
| **CO3** | **Analyze** authentication, confidentiality and privacy issues in cloud computing. | **PO1,PO2** |
| **CO4** | **Identify** security implications in cloud computing. | **PO2,PO3,PO4, PO5,PO7** |
| **CO5** | **Understand** the importance of protocols and standards in management for cloud services. | **PO1,PO6,PO12** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61106 | Cloud Computing(Elective -IV) | 3 | 3 | 2 | 1 | 2 | 1 | 1 | - | - | - | - | 2 |

1=weakly mapped 2= moderately mapped 3=strongly mapped

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Cloud Computing (Elective -IV)

PAPER CODE: ECS61106

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 02

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Discuss** in detail the Technologies For Network Based Systems? | **U** | **CO2** |
| 2. | **Define** Virtual Machines And Virtualization Middleware? | **R** | **CO3** |
| ­­­ 3. | **Define** distributed system. | **R** | **CO1** |
| 4. | **Define** is cloud computing with example? | **R** | **CO3** |
| 5. | **Define** Amazon Elastic Compute Cloud (EC2)? | **R** | **CO5** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Explain** the cloud computing benefits and limitation? | **U** | **CO4** |
| 7. | **Differentiate** between cloud and grid. | **An** | **CO3** |
| 8. | **What** are the legal issues in cloud computing? | **R** | **CO3** |
| 9. | **Compare** different service models of cloud computing. | **U** | **CO2** |
|  | **SECTION C (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **List** and explain the usage scenarios and applications of cloud. | **R** | **CO5** |
| 11. | **Determine** the following challenges in cloud  i. Security.  ii. Datalock-in and Standardization.  iii. Fault tolerance and Disaster recovery. | **E** | **CO2** |
| 12. | **Show** the difference between Thin and Thick client. | **AP** | **CO1** |

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| **ECS61108** | Neural Network and Deep Learning (Elective-IV) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Introduction to probability theory, linear algebra or statistics** | | | | |
| **Co-requisites** | **Python, prior knowledge of some machine learning algorithms and data structures is very useful.** | | | | |

**Course Objectives:**

* To understand the motivation for different neural network architectures and select the appropriate architecture for a given problem
* To understand what the major categories of models are (such as CNNs and RNNs), and when they should be applied
* To apply backpropagation algorithm for calculating weight gradients in a feed forward neural network

**Course Outcomes:**

On completion of this course, the students will be able to

CO1**. Recall**basics on Artificial Intelligence and Neural Network

CO2**. Illustrate**ANN learning, Error correction learning, Memory-based learning, Hebbian

learning, Competitive learning and Boltzmann learning

CO3**. Apply** deep learning algorithms and solve real world problems.

CO4**. Examine** deep learning algorithms which are more appropriate for various types of learning

tasks in various domains.

CO5. **Evaluate** and interpret the results and performance of the algorithms.

**Catalog Description:**

Artificial Neural Networks are programs that write themselves when given an objective, some training data, and abundant computing power. Recently, these programs have brought about a wide array of future-like innovations, such as self-driving cars, face recognition, and human-like speech generators. This course offers you an introduction to Deep Artificial Neural Networks (i.e. “Deep Learning”). With focus on both theory and practice, we cover models for various applications, how they are trained and tested, and how they can be deployed in real world applications.

**Course Content:**

**Unit I: 10 lecture hours**

**Introduction:** what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

**Learning Process:** Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process

**Unit II: 5 lecture hours**

**Single Layer Perceptron’s:** Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perception –convergence theorem, Relation between perception and Bayes classifier for a Gaussian Environment.

**Multilayer Perceptron:** Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection.

**Unit III: 10 lecture hours**

**Back Propagation:** Back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning.

**Self Organization Maps:** Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive patter classification, Hierarchal Vector quantilizer, contexmel Maps.

**Neuro Dynamics:** Dynamical systems, stability of equilibrium states, attractors, neuro-dynamical models, manipulation of attractors’ as a recurrent network paradigm

**Unit IV: 15 lecture hours**

**Deep Learning:** Recent developments in deep neural networks, Limiting the size of the weights, Using noise as a regularize, The ups and down of back propagation, Introduction to full Bayesian approach, The Bayesian interpretation of weight decay, Mackay's quick and dirty method of setting weight costs.

**Convolutional Neural Networks:** Invariance, stability. Variability models (deformation model, stochastic model),Scattering networks Group Formalism, Supervised Learning: classification, Properties of CNN representations: inevitability, stability, invariance, covariance/invariance: capsules and related models,Connections with other models: dictionary learning, LISTA, other tasks: localization, regression, Embedding (DrLim), inverse problems, Extensions to non-euclideandomains, Dynamical systems: RNNs.

**Deep Unsupervised Learning:** Autoencoders (standard, Denoising, contractive, etcetc), VariationalAutoencoders ,Adversarial Generative Networks , Maximum Entropy Distributions.

**Unit V: 5 lecture hours**

**Advance Topics:** Non-convex optimization for deep network, Stochastic optimization, Attention and Memory Models , Open Problems.

**Text Books:**

1. Neural networks A comprehensive foundations”, Simon Hhaykin, Pearson Education 2nd

Edition 2004.

2. Deep Learning, Ian Goodfellow, YoshuaBengio, and Aaron Courville, MIT press, 2016.

**Reference Books:**

1.Artificial neural networks, B.Vegnanarayana Prentice Hall of India P Ltd, 2005.

2.Neural networks in Computer intelligence”, Li Min Fu, TMH, 2003.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Mid Term** | **Attendance** | **Class Assessment** | **End Term** |
| **Weightage (%)** | **20** | **10** | **30** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Recall**basics on Artificial Intelligence and Neural Network | **PO1, PO2, PO3, PO4** |
| **CO2** | **Illustrate**ANN learning, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning and Boltzmann learning | **PO1, PO2, PO3, PO4, PO5** |
| **CO3** | **Apply** deep learning algorithms and solve real world problems. | **PO1, PO2, PO3, PO4, PO5** |
| **CO4** | **Examine** deep learning algorithms which are more appropriate for various types of learning tasks in various domains. | **PO1, PO2, PO3, PO4, PO5, PO12** |
| **CO5** | **Evaluate** and interpret the results and performance of the algorithms. | **PO1, PO2, PO3, PO5, PO6** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61108 | Neural Network and Deep Learning(Elective -IV) | 3 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 |

1=weakly mapped 2=moderately mapped 3=strongly mapped

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Neural Network and Deep Learning (Elective -IV)

PAPER CODE: ECS61108

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 02

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **SECTION A (Answer All questions)5\*1=5** | | | |
| 1. | **What** is neural network? Explain about multilayer perceptron model. | **U** | **CO1**  **CO2** |
| 2. | **What** is the role of activation functions in neural network? Name the concept and briefly explain” Function is a measure to evaluate how good your model’s performance is” | **U** | **CO1** |
| ­­­ 3. | **What** do you understand by back propagation? | **U** | **CO1** |
| 4. | **What** is the difference between a feed forward neural network and recurrent neural network? | **U** | **CO2**  **CO3** |
| 5. | **What** is an auto-encoder? | **R** | **CO5** |
|  | **SECTION B (**Attempt any **Three Questions)3\*5=15** |  | |
| 6. | a)**What** are Hyperparameters?  b) **What** will happen if the learning rate is too slow or too high?  c) **What** are neural network elements? | **U** | **CO1**  **CO3** |
| 7. | a)**What** are Softmax and ReLU functions?  b) **Explain** gradient descent. | **U** | **CO3**  **CO4** |
| 8. | a) **Explain** Bayesian Classifier. Identify working of Bayesian Classifier for a Gaussian Environment?  b) **Briefly** describe learning process in form of error correction, memory based, Hebbian? | **U** | **CO4**  **CO5** |
| 9. |  |  |  |
|  | **SECTION C (**Attempt any **Two Questions)2\*10=20** |  | |
| 10. | The following diagram represents a feed-forward neural network with one hidden layer:  Diagram  Description automatically generated  A weight on connection between nodes i and j is denoted by wij, such as w13 is the weight on the connection between nodes 1 and 3. The following table lists all the weights in the network:   |  |  | | --- | --- | | w13=-2  w23=3 | w35=1  w45=-1 | | w14=4  w24=-1 | w36=-1  w46=1 |   Each of the nodes 3, 4, 5 and 6 uses the following activation function:  ϕ(v) = 1 if v ≥0  0 otherwise  where v denotes the weighted sum of a node. Each of the input nodes (1 and 2) can only receive binary values (either 0 or 1). Calculate the output of the network (y5 and y6) for each of the input patterns:  Patterns P1 P2 P3 P4  Node 1: 0 1 0 1  Node2: 0 0 1 1 | **Ap** | **CO1**  **CO2** |
| 11. | **Explain** various type of learning. Why deep learning has more advantage over traditional machine learning? | **R** | **CO3** |
| 12. | **Explain** principle of forward propagation and back propagation algorithm in case of deep learning. | **R** | **CO4** |

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| **ECS61110** | Advances in Compiler Design (Elective-IV) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Data Structure, Algebra, Probability & Statistics** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objective:**

1. The aim of this module is to show how to apply the theory of language translation introduced in the prerequisite courses to build compilers and interpreters
2. These techniques can also be employed in wider areas of application, whenever we need a syntax-directed analysis of symbolic expressions and languages and their translation into a lower-level description. They have multiple applications for man-machine interaction, including verification and program analysis.
3. In addition to the exposition of techniques for compilation, the course will also discuss various aspects of the run-time environment into which the high-level code is translated. This will provide deeper insights into the more advanced semantics aspects of programming languages, such as recursion, dynamic memory allocation, types and their inferences, object orientation, concurrency and multi-threading.

**Course Outcomes:**

On completion of this course, the students will be able to

1. **Understand** the major phases of compilation and to understand the knowledge of Lex tool & YAAC tool
2. **Develop**  the parsers and experiment the knowledge of different parsers design without automated tools
3. **Construct** the intermediate code representations and generation
4. **Apply**  for various optimization techniques for dataflow analysis

**Catalog Description:**

The main objective of this course is to introduce the major concept areas of language translation and compiler design and to develop an awareness of the function and complexity of modern compilers. This course is a study of the theory and practice required for the design and implementation of interpreters and compilers for programming languages

**Course Content:**

**Unit I: 10 lecture hours**

**Review of compiler structure:** lexical analysis, parsing, semantic analysis, error recovery and intermediate code generation; Runtime storage management; Code optimization; Code generation;

Retarget able compiler: an overview.

**Unit II: 5 lecture hours**

**Introduction to Code optimization:** The importance of code optimization. Structure of optimizing compilers. Placement of optimizations in hugely optimizing compilers. Importance of individual optimizations. Order and repetition of optimization.

**Unit III: 20 lecture hours**

**Optimizing compilers::Basic block:** Peephole optimization.

**Loop optimization:**[Induction variable](https://en.wikipedia.org/wiki/Induction_variable), [Strength reduction](https://en.wikipedia.org/wiki/Strength_reduction), [Loop fusion](https://en.wikipedia.org/wiki/Loop_fusion), [Loop inversion](https://en.wikipedia.org/wiki/Loop_inversion), [Loop interchange](https://en.wikipedia.org/wiki/Loop_interchange), [Loop-invariant code motion](https://en.wikipedia.org/wiki/Loop-invariant_code_motion), [Loop nest optimization](https://en.wikipedia.org/wiki/Loop_nest_optimization), [Loop unrolling](https://en.wikipedia.org/wiki/Loop_unrolling), [Loop splitting](https://en.wikipedia.org/wiki/Loop_splitting), [Loop unswitching](https://en.wikipedia.org/wiki/Loop_unswitching), [Bounds-checking elimination](https://en.wikipedia.org/wiki/Bounds-checking_elimination); [Software pipelining](https://en.wikipedia.org/wiki/Software_pipelining)**,** [Automatic parallelization](https://en.wikipedia.org/wiki/Automatic_parallelization)

[**Data-flow analysis**](https://en.wikipedia.org/wiki/Data-flow_analysis)**:**[Common subexpression elimination](https://en.wikipedia.org/wiki/Common_subexpression_elimination); [Constant folding](https://en.wikipedia.org/wiki/Constant_folding)**,** [Induction variable recognition and elimination](https://en.wikipedia.org/wiki/Induction_variable_recognition_and_elimination)**,** [Dead store](https://en.wikipedia.org/wiki/Dead_store) elimination**,** [Use-define chain](https://en.wikipedia.org/wiki/Use-define_chain)**,** [Live variable analysis](https://en.wikipedia.org/wiki/Live_variable_analysis)

**Static single assignment form based:**[Global value numbering](https://en.wikipedia.org/wiki/Global_value_numbering)**,** [Sparse conditional constant propagation](https://en.wikipedia.org/wiki/Sparse_conditional_constant_propagation).

[**Code generation**](https://en.wikipedia.org/wiki/Code_generation_(compiler))**:**[Register allocation](https://en.wikipedia.org/wiki/Register_allocation), [Instruction selection](https://en.wikipedia.org/wiki/Instruction_selection), [Instruction scheduling](https://en.wikipedia.org/wiki/Instruction_scheduling), [Rematerialization](https://en.wikipedia.org/wiki/Rematerialization)

**Procedure optimizations**: Tail recursion elimination and tail call optimization, Procedure integration; In-line expansion.

**Global**: Inter-procedural optimizations

**Static analysis:**[Alias analysis](https://en.wikipedia.org/wiki/Alias_analysis), [Pointer analysis](https://en.wikipedia.org/wiki/Pointer_analysis), [Shape analysis](https://en.wikipedia.org/wiki/Shape_analysis_(software)), [Escape analysis](https://en.wikipedia.org/wiki/Escape_analysis), [Array access analysis](https://en.wikipedia.org/wiki/Array_access_analysis); [Dependence analysis](https://en.wikipedia.org/wiki/Dependence_analysis), [Control flow analysis](https://en.wikipedia.org/wiki/Control_flow_analysis),

[Data flow analysis](https://en.wikipedia.org/wiki/Data_flow_analysis).

**Unit IV: 5 lecture hours**

Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope. Intermediate Code Generation: Translation of different language features, different types of intermediate forms.

**Unit V: 5lecture hours**

**Optimizing for parallelism and locality**: Loop level parallelism and data locality, Execution order for loop nests, controlling the order of execution, data reuse; Data dependence analysis; Synchronization-Free Parallelism; Locality Optimizations.

**Text Books:**

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools, Addison-Wesley.
2. Michael L. Scott, Programming Language Pragmatics, Elsevier.
3. Andrew W. Appel, Modern Compiler Implementation in C/Java, Cambridge University Press.
4. Steven S. Muchnik, Advanced Compiler Design and Implementation, Elsevier.

**Reference Books:**

1. Michael L. Scott, Programming Language Pragmatics, Elsevier
2. Randy Allen and Ken Kennedy, Optimizing Compilers for Modern Architectures, Elsevier

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Understand** the major phases of compilation and to understand the knowledge of Lex tool & YAAC tool | **PO1,PO2,PO5,PO6,PO12** |
| **CO2** | **Develop** the parsers and experiment the knowledge of different parsers design without automated tools | **PO1,PO2,PO5,PO6,PO12** |
| **CO3** | **Construct** the intermediate code representations and generation | **PO1,PO2,PO5,PO6,PO12** |
| **CO4** | **Apply** for various optimization techniques for dataflow analysis | **PO1,PO2,PO5,PO6,PO12** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61110 | Advanced Compiler Design (Elective -IV) | 3 | 3 | - | - | 3 | 3 | - | - | - | - | - | 3 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name:**  **Enrolment No:** | |  | | |
| **ADAMAS UNIVERSITY**  **SCHOOL OF ENGINEERING AND TECHNOLOGY**  **END-SEMESTER EXAMINATION**  **Name of the Program: M.Tech Semester: II**  **Code- ECS61110 Stream- CSE Time: 03 Hrs.**  **Paper title– Advanced Compiler Design (Elective -IV)Total pages- 2**  **Max. Marks: 40 Total no. of questions- 12**  **Instructions:**  Attempt All Questions from **Section A** (Each Carrying 1 Marks); any **Three Questions** from **Section B** (Each Carrying 5 Marks)**.** Any **Two Questions from Section C** (Each Carrying 10 Marks)**.**  1. **At top of sheet, clearly mention Name, Roll No., Enrolment No., Paper Name & Code, and Date of Exam.**  2. **Assumptions made if any, should be stated clearly at the beginning of your answer.**  3. **All parts of a Question should be answered consecutively.** | | | | |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | | |
| 1. | **What** do you understand by Scope of a Variable . | | **R** | **CO1** |
| 2. | **What** is a Handle ? | | **R** | **CO1** |
| ­­­ 3. | **What** do you understand by ‘L-attributed’ SDD . | | **R** | **CO2** |
| 4. | **What** is Parameter Passing ? | | **R** | **CO1** |
| 5. | **What** do you understand by language processor | | **R** | **CO1** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** | |  | |
| 6 | **Construct** a DFA that accepts all strings of ‘a’ and ‘b’ . Such that number of ‘a’s is divisible by 2 and number of ‘b’s is divisible by 3 . | | **C** | **CO2** |
| 7 | **State** the generalized working principle of LR parsers. | | **Ap, R** | **CO2** |
| 8 | **Explain** with example the parser stack Implementation of Postfix SDT. | | **U** | **CO3** |
| 9 | **Explain** briefly the role of Lexical Analyser | | **U** | **CO2** |
|  | **SECTION C (Answer Any Two Questions) (2 x 10 = 20)** | |  | |
| 10 | **Construct** the predictive parsing table for the grammar given below :  E→+TE’|ε  T→\*FT’|ε  F→(E)|id  And also conclude whether this grammar is LL(1). | | **C** | **CO3** |
| 11 | **Construct** the grammars for the given Languages –   * + 1. . | | **C** | **CO3** |
| 12. | **Construct** the LR(1) item sets and the corresponding CLR parsing table for the augmented grammar given below:  Also conclude how CLR parser resolves the conflicts. | | **C** | **CO3** |

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| **ECS61112** | Machine Learning (Elective –V) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Data Structure, Algebra, Probability & Statistics** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To help the student to acquire knowledge of basics of artificial intelligent computing.
* To enable students to gain basic knowledge of machine learning.
* To incorporate the evolutionary computational knowledge.
* To enable students to acquire various problem solving, learning, and planning ability.
* To enable students to apply machine learning models to solve real-life problems.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1.**Identify** and discuss the Mathematical Preliminaries for Machine Learning.

CO2.**Discuss** about Supervised Learning and identify or recognize the different algorithms falling under this category.

CO3.**Discuss** about Unsupervised Learning and solve different algorithms falling under this category.

CO4.**Identify** the Learning Theory by sketching the various Ensemble Methods of Machine Learning.

CO5.**Classify** the basic ideas of Bayesian Learning and try to implement some model which is based on it.

**Catalog Description:**

There is a growing need for talented machine learning/data scientist developers across every industry. As technology advances, the ability to build quality machine learning driven software while considering design, development, security, and maintenance is sought after amongst all kinds of companies, from finance and banking to healthcare and national security.

Machine Learning applies the knowledge and theoretical understanding gained through computer science to building high-quality intelligent software products. As a maturing discipline, Artificial Intelligence is becoming more and more important in our everyday lives. Our [software development and engineering](http://www.pace.edu/seidenberg/software-development-engineering-ms)professional program is University’s response to the tremendous growth of the software development industry.

**Course Content:**

**Unit I: 9 lecture hours**

Mathematical Preliminaries for Machine Learning: Basic over view of Linear Algebra, Intercepts and Slope, Probability, Random Variable, Matrix Theory, Vectors, Optimization, Multivariate Normal Distribution, Multivariate Calculus, Brief Introduction on MATLAB/Python.

**Unit II: 9 lecture hours**

Supervised Learning: Learning by Computing Distances: Distance from Means and Nearest Neighbours; Learning by Asking Questions: Decision Tree based Classification and Regression, Linear Regression: optimization and gradient descent; Logistic Regression: K-Nearest Neighbour Classifier; Naïve Bayes Classifier; Support Vector Machines: Linear case and Non-linear case; Random Forest Classifier.

**Unit III: 9 lecture hours**

Unsupervised Learning: Uses of Unsupervised Learning; Data Clustering: K-means and Kernel K-means; Linear Dimensionality Reduction: Principal Component Analysis, Multiple Discriminant Analysis; Nonlinear Dimensionality Reduction via Kernel PCA; Matrix Factorization and Matrix Completion; Introduction to Generative Models; Generative Models for Clustering: GMM and Intro to EM; Expectation Maximization and Generative Models for Dimensionality Reduction.

**Unit IV: 9 lecture hours**

**Learning Theory:** Introduction to Learning Theory, VC Dimension; Ensemble Methods: Boosting: Basic, Illustrations and Equations; Boosting versus Bagging; Semi-supervised Learning.

**Unit V: 9 lecture hours**

Bayesian Classifier, Belief Network, Probabilistic Graphical Model: Bayesian Network Representations and Semantics; Decision Making under uncertainty; Knowledge Engineering;

**Text Books:**

1.“Machine Learning”, T.M. McGraw-Hill, Tom M. Mitchell, McGraw-Hill, 1997

2.“Pattern Recognition and Machine Learning”, C. Bishop, Springer, 2006.

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**Reference Books**

1.“Machine Learning”, E. Alpaydin, MIT Press, 2010.

2.“Introduction to statistical pattern recognition”, K. Fukunaga, Academic press, 2013.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Identify** and discuss the Mathematical Preliminaries for Machine Learning. | **PO2** |
| **CO2** | **Discuss** about Supervised Learning and identify or recognize the different algorithms falling under this category. | **PO1, PO2, PO3** |
| **CO3** | **Discuss** about Unsupervised Learning and solve different algorithms falling under this category. | **PO1, PO4** |
| **CO4** | **Identify** the Learning Theory by sketching the various Ensemble Methods of Machine Learning. | **PO1, PO5** |
| **CO5** | **Classify** the basic ideas of Bayesian Learning and try to implement some model which is based on it. | **PO4** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61112 | Machine Learning(Elective -V) | 3 | 2 | 1 | 2 | 1 | - | - | - | - | - | - | - |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Machine Learning (Elective -IV) PAPER CODE: ECS61112

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **What** is Heuristic value? | **R** | **CO1** |
| 2. | **How** do you symbolize existential quantifiers? | **R** | **CO2** |
| ­­­3. | **State** if Bayesian Learning is parametric model or not? | **R** | **CO5** |
| 4. | In **which** category of clustering K-Means clustering belong to? | **R** | **CO4** |
| 5. | In PCA **which** concept of mathematics is used? | **R** | **CO3** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | Express **what** is ridge in context of Hill-Climbing algorithm? | **R** | **CO2** |
| 7. | **Explain** the theme of Backtracking search for CSP. | **U** | **CO4** |
| 8. | **What** is maximum margin classifier? Explain what are Support vectors in SVM. | **R** | **CO3** |
| 9. | **Describe** the process of PCA. How PCA helps reducing the size of the dataset? | **R** | **CO4** |
|  | **SECTION (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Derive** the weight update rule for a single hidden layer in backpropagation. Ap | **AP** | **CO2** |
| 11. | **Write** short notes on: - i) Bias ii) Variance. **Explain** using Simple Linear Regression | **AN** | **CO1** |
| 12. | Cluster the dataset using K-Means clustering into 4 clusters. **Find** out the inter-cluster dissimilarity and intra-cluster similarity. R | **R** | **CO4** |

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| **ECS61114** | Information Retrieval (Elective -V) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours - 45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Pattern Recognition, Natural language processing** | | | | |
| **Co-requisites** | **Machine Learning** | | | | |

**Course Objectives:**

* Present the basic concepts in information retrieval and more advance techniques of multimodal based information systems.
* Understand the underlined problems related to IR.
* Acquired the necessary experience to design, and implement real applications using Information Retrieval systems.
* To enable students to acquire knowledge on vector space model and Computing Scores in a Complete Search System.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Discuss** various techniques to retrieve information.

CO2. **Describ**e the various preprocessing techniques like stop words removal, stemming, etc

CO3. **Explain** the Index Construction and the Index Compression Statistical properties

CO4. **Demonstrate** the concepts of vector space to implement in various digital information environments and Computing Scores in a Complete Search System.

CO5. **Evaluation** in Information Retrieval.

**Catalog Description:**

Information retrieval is the process through which a computer system can respond to a user's query for text-based information on a specific topic. IR was one of the first and remains one of the most important problems in the domain of natural language processing (NLP). Web search is the application of information retrieval techniques to the largest corpus of text anywhere — the web — and it is the context where many people interact with IR systems most frequently.

**Course Content:**

**Unit I: 5 lecture hours**

Introduction: Basics of Information Retrieval and Introduction to Search Engines; Boolean

Retrieval: Boolean queries, Building simple indexes, Processing Boolean queries

**Unit II: 10 lecture hours**

Term Vocabulary and Posting Lists: Choosing document units, Selection of terms, Stop word elimination, Stemming and lemmatization, Skip lists, Positional postings and Phrase queries; Dictionaries and Tolerant Retrieval: Data structures for dictionaries, Wildcard queries, Permuterm and K-gram indexes, Spelling correction, Phonetic correction.

**Unit III: 8 lecture hours**

Index Construction – Single pass scheme, Distributed indexing, Map Reduce, Dynamic indexing; Index Compression Statistical properties of terms, Zipf's law, Heap's law, Dictionary compression, Postings file compression, Variable byte codes, Gamma codes.

**Unit IV: 12 lecture hours**

Vector Space Model – Parametric and zone indexes, Learning weights, Term frequency and weighting, Tf-Idf weighting, Vector space model for scoring, variant tf-idf functions. Computing Scores in a Complete Search System – Efficient scoring Inexact retrieval, Champion lists, Impact ordering, Cluster pruning, Tiered indexes, Query term proximity, Vector space scoring and query operations.

**Unit V: 10 lecture hours**

Evaluation in Information Retrieval: Standard test collections, unranked retrieval sets, Ranked retrieval results, Assessing relevance, User utility, Precision and Recall, Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Evaluation of relevance feedback.

**Text Books:**

1. “An Introduction to Information Retrieval”, C. D. Manning, P. Raghavan, H. Schutze, Cambridge University Press, 2009.

**Reference Books:**

1. “Modern Information Retrieval”, R. Baeza and B. Ribeiro-Neto, Pearson Education, 1999.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Discuss** various techniques to retrieve information. | **PO1. PO2** |
| **CO2** | **Describe t**he various preprocessing techniques like stop words removal, stemming, etc. | **PO3, PO4** |
| **CO3** | **Explain** the Index Construction and the Index Compression Statistical properties | **PO4, PO5, PO6** |
| **CO4** | **Demonstrate** the concepts of vector space to implement in various digital information environments and Computing Scores in a Complete Search System. | **PO12** |
| **CO5** | **Evaluation** in Information Retrieval. | **PO7** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61114 | Information Retrieval (Elective-V) | 1 | 1 | 1 | 2 | 1 | 1 | 1 | - | - | - | - | 1 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Information Retrieval (Elective -IV) PAPER CODE: ECS61114

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **SECTION A (Attempt all) (5 X 1=5)** | | | |
| 1. | **Explain** Stemming. | **R** | **CO1** |
| 2. | **Explain** Document Indexing. | **U** | **CO2** |
| ­­­ 3. | **Explain** Query Processing in Information Retrieval. | **U&R** | **CO3** |
| 4. | **Explain** the difference between Binary Tree and B Tree. | **R** | **CO1, CO2** |
| 5. | **What** is conflation? | **U** | **CO4** |
|  | **SECTION B (**Attempt any **Three Questions)3\*5=15** |  | |
| 6. | **What** are the applications of Information Retrieval? | **Ap** | **CO3** |
| 7. | **Explain** Query Processing in Information Retrieval with suitable example. | **U & C** | **CO4** |
| 8. | **Explain** the difference between Binary Tree and B Tree. | **An** | **CO5** |
| 9. | **Explain** the type of natural language technology used in information retrieval. | **U** | **CO2** |
|  | **SECTION C (**Attempt any **Two Questions) 2\*10=20** |  | |
| 10. | **Explain** Term Frequency in Information Retrieval with suitable example. | **E & R** | **CO4,**  **CO1, CO2** |
| 11. | **Explain** Boolean Model of Information Retrieval with pseudo code and example. | **R & U** | **CO5** |
| 12. | **Define** Zipf’s law. | **U** | **CO3** |

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| **ECS61116** | Computational Complexity(Elective-V) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours-45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Theory of Computation, Automata Theory** | | | | |
| **Co-requisites** |  | | | | |

**Course Objectives:**

* To acquire knowledge about concept of complexity with respect to execution time and memory space
* To apply formal notion of reduction in order to extend properties of known problems to new ones.
* To describe problem and problem instances in a formal precise way.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Discuss** the solutions of simple problems in terms of a universal computational model

CO2. **Illustrate** quantitative criteria to describe the complexity of an algorithm with respect to

instance size

CO3. **Identify** optimization problem into appropriate approximations complexity classes.

CO4. **Analyse** how extension of the basic computing model can benefit the solution of some

problem classes.

CO5. **Evaluate** the concept of interactive proofs in the analysis of optimization problems.

**Catalog Description:**

This course is an introduction to the theory of computational complexity and standard complexity classes. One of the most important insights to have emerged from Theoretical Computer Science is that computational problems can be classified according to how difficult they are to solve. This classification has shown that many computational problems are impossible to solve, and many more are impractical to solve in a reasonable amount of time. To classify problems in this way, one needs a rigorous model of computation, and a means of comparing problems of different kinds. This course introduces these ideas and shows how they can be used.

**Course Content:**

**Unit I: 6 lecture hours**

Models of computation, Problem Definitions, Models of Computation , FSM Language Recognition , TM Language Recognition , The Classes P and NP , NP-complete Languages

**Unit II: 9 lecture hours**

Classes P and NP, The classes P and NP, NP-complete languages, Proof that CIRCUIT SAT is NP-complete.NP-complete languages, NAESAT is NP-complete, 0-1 integer programming is NP-complete, INDEPENDENT SET is NP-complete, CLIQUE is NP-complete.

**Unit III: 7 lecture hours**

Space complexity, Complexity Classes, Proper Resource Bounds, Hierarchy Theorems, Savitch's Theorem.Complements of Complexity classes, Review of Space Complexity, Complements of Complexity Classes, coNP , Polynomial Time Hierarchy.

**Unit IV: 7 lecture hours**

PSPACE- complete Languages, Complexity Class Containment, Polynomial Hierarchy, **PH** Complete Problems, Games and TQBF , TQBF is **PSPACE**-Complete. Diagonalization and Reduction, A First Application of Diagonalization, Halting is Undecidable Resource-Bounded Reductions , Log space Reductions , Hard and Complete, Problems, Diagonalization , Time Hierarchy Theorem , Oracle Turing Machines, Under Relativization Both **P** = **NP** and **P** ≠ **NP.**

**Unit V: 8 lecture hours**

Parallel Complexity Classes, Turing Machines and Complexity, Parallel Models of Computation, The PRAM and Complexity Classes, Circuits and Complexity Classes **NC** and **P**/poly.Randomized Computation, Randomized algorithms, Average case complexity, Bounded-error complexity classes, Identity and Primality testing.

**Unit VI: 8 lecture hours**

Interactive Proof I, Randomized Reductions, Two- and Three-Stage Proofs, Interactive Proofs and IP.Interactive proofs II, Interactive Proofs, Private versus Public Randomness, Bounding the Prover's Resources.Interactive Proofs III, interactive Proofs, One-way functions, Zero-Knowledge Proofs   
IP and PSPACE, The Power of Interactive Proofs, Probabilistically Checkable Proofs.

**Text Books:**

1.Computational Complexity: A Modern Approach, Sanjeev Arora and Boaz Barak, Cambridge University Press.

2.Models of Computation, Exploring the Power of Computing, John E. Savage, Pearson, 1997.

**Reference Books:**

1. Elements of the Theory of Computation, H. Lewis and C. Papadimitriou, Prentice Hall, 1998.

2. Introduction to automata theory, languages, and computation”, J Hopcroft and J Ullman, Addison-Wesley, 1979.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Mid Term** | **Attendance** | **Class Assessment** | **End Term** |
| **Weightage (%)** | **20** | **10** | **30** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Discuss** the solutions of simple problems in terms of a universal computational model | **PO1, PO2** |
| **CO2** | **Illustrate** quantitative criteria to describe the complexity of an algorithm with respect to instance size | **PO1,PO2,PO3,PO4,PO5,** |
| **CO3** | **Identify** optimization problem into appropriate approximations complexity classes. | **PO1, PO2,**  **PO3, PO4** |
| **CO4** | **Analyse** how extension of the basic computing model can benefit the solution of some problem classes. | **PO1, PO2, PO3,**  **PO4** |
| **CO5** | **Evaluate** the concept of interactive proofs in the analysis of optimization problems. | **PO1, PO2, PO3, PO6** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61116 | Computational complexity(Elective -V) | 3 | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - |

1=weakly mapped 2=moderately mapped 3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Computational complexity (Elective -V) PAPER CODE: ECS61116

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **SECTION A (Answer All questions)** | | | |
| 1. | **Proof** the statement “HALT is not computable by any Turing Machine.” | **U** | **CO1**  **CO2** |
| 2. | **Write** the criticism of class P. State some efforts to address them. | **U** | **CO1** |
| ­­­ 3. | **Show** that for every time-constructible T:N -> N, if L ϵ DTIME(T(n)), then there is an oblivious TM that decides L in time O(T(n)log T(n)). | **U** | **CO1** |
| 4. | **Define** a two-dimensional Turing Machine to be a TM where each of its tape is an infinite grid. Show that for every T:N -> N and every Boolean function f, if g can be computed in time T(n) using a two-dimensional TM the f ϵ DTIME(T(n)2). | **An** | **CO2**  **CO3** |
| 5. | **What** is Space complexity? | **R** |  |
|  | **SECTION B (**Attempt any **Three Questions)** |  | |
| 6. | **Proof** the following statement.   1. All languages accepted by NTMs are recursively enumerable. 2. All functions computed by NTMs are partial recursive. | **U** | **CO1** |
| 7. | a) **What** is NP complete class of problems?  b) **What** are optimization and decision problems? | **U** | **CO2** |
| 8. | **What** are NP hard problems? Write the algorithm for Hill Climbing. | **U** | **CO3** |
| 9. | **Find** the time complexity of the following code  int I, j, k = 0;  for (I = n / 2; I<= n; i++) {      for (j = 2; j <= n; j = j \* 2) {          k = k + n / 2;      }  }  Also explain the concept of time and space complexity. | **U** | **CO4** |
|  | **SECTION C (**Attempt any **Two Questions)** |  | |
| 10. | In the CLIQUE problem, we are given an undirected graph and an integer K and have to decide whether there is a subset S of at least K vertices such that every two distinct vertices u, v ϵ S have an edge between them. In the VERTEX COVER problem, we are given an undirected graph G and an integer K and have to decide whether there is a subset of at most K vertices such that for every edge I, j of G, at least one of I or j is in S. **Prove** that both these problems are NP-complete. | **An** | **CO2**  **CO4** |
| 11. | **Show** that every time-constructible T:N->N, if Lϵ DTIME(T(n)), then there is an oblivious TM that decised L in time O(T(n) log T(n)). | **U** | **CO4** |
| 12. | **Explain** the concept of Interactive Proof along with its types. | **U** | **CO5** |

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| **ECS61118** | Formal Systems (Elective -VI) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Basic computer knowledge** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To apply knowledge and skills on real benefits and constrains of using formal methods in systems design.
* To acquire knowledge of target system modelling,
* To specify desired structural and behavioural properties and applying procedures that check whether these properties were satisfied.

**Course Outcomes:**

On the successful completion of the course, students will be able to

1. **Explain** the notion of correct system execution.
2. **Distinguish** between correct and incorrect system behaviour.
3. **Apply** formal logic in expressing (desired) system behaviour.
4. **Analyse** and classify the output of tool for formal system verification.
5. **Modify** the system structure in order to satisfy the desired behaviour.
6. **Design** and integrate or modify tools for formal system verification.
7. **Generate** formal models of real systems suitable for verification.

**Catalog Description:**

Mathematically based specification, development and verification procedures of hardware and software systems, aspiring to enhance the quality of final product and at the same time cut down time-to-market period. Mathematical logic as a foundation for specification languages. Deductive systems. Varieties of formal specification languages. Models of hardware and software system implementations. Specification and verification of computational and reactive systems. Theorem proving and model checking verification procedures. Tools for automated formal system verification. Formal conceptual modeling. Application of formal methods in diverse domains of computer hardware and software engineering.

**Course Content:**

**Unit I: 10 lecture hours**

Formal languages and their related automata, Turing machines, type-0 languages, linear bounded automata and CSLs. Time and tape bounded Turing machines, time and space bounds for recognizing CFLs.

**Unit II: 13 lecture hours**

Turing Computability- number theoretic computations by Turing machines and indexing. Axiomatic systems, their soundness and completeness.

**Unit III: 12 lecture hours**

Recursive function theory- primitive recursive functions and primitive recursive predicates. Ackermann’s function, recursive and general recursive functions.

**Unit IV: 10 lecture hours**

Computability and decidability- computable functions, computable sets, decision problems. Fix point theory of programs, functions and functional, verification methods, Lambda calculus and applications.

**Text Books:**

1. “Introduction to Automata Theory Languages and Computation”. Hopcroft H.E. and Ullman J. D. Pearson Education.
2. “An Introduction to Functional Programming Through Lambda Calculus”, Greg Michaelson
3. “Introduction to Theory of Computation” Sipser M. 2nd edition Thomson.

**Reference Books:**

1. “Theory of Computer Science - Automata languages and computation”, Mishra and Chandrashekaran, 2nd edition, PHI.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Class Assessment** | **Mid Term** | **End Term** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Explain** the notion of correct system execution. | **PO2, PO3, PO4** |
| **CO2** | **Distinguish** between correct and incorrect system behaviour. | **PO1,PO2, PO6** |
| **CO3** | **Apply** formal logic in expressing (desired) system behaviour. | **PO11, PO12** |
| **CO4** | **Analyse** and classify the output of tool for formal system verification. | **PO5** |
| **CO5** | **Modify** the system structure in order to satisfy the desired behaviour. | **PO3,PO4, PO6** |
| **CO6** | **Design** and integrate or modify tools for formal system verification. | **PO3, PO5** |
| **CO7** | **Generate** formal models of real systems suitable for verification | **PO9** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61118 | Formal Systems (Elective -VI) | 1 | 2 | 3 | 2 | 2 | 2 | - | - | 1 | - | 1 | 1 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Formal Systems (Elective -VI) PAPER CODE: ECS61118

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **State** Myhilll-Nerode’s Theorem | **R** | **CO1** |
| 2. | **What** are the basic limitations of Finite State Machines? | **U** | **CO2** |
| ­­­ 3. | **Explain** the use of Pumping Lemma for CFL. | **U&R** | **CO5** |
| 4. | **How** can we determine the input sequence of an information lossless machine | **R** | **CO1, CO3** |
| 5. | **Write** the definition of a lossless machine.5 |  |  |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | a) **Explain** Ackermann’s function.  b) Reduce the following grammar to GNF:  S🡪A0, A 🡪0B, B 🡪 0A, B 🡪 1 | **Ap** | **CO3** |
| 7. | Prove the following indentity:  r (s + t) = rs + st | **U** | **CO2, CO6** |
| 8. | **What** do you mean by sub-tree of a derivation tree? | **An** | **CO5** |
| 9. | **Why** a Turing machine is called linear bound Automata? | **R & U** | **CO5, CO6** |
|  | **SECTION C(Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | A long sequence of input pulses enters a two-input, two-output synchronous sequential circuit, **which** is required to produce an output pulse Z=1, whenever a sequence 010101 occurs. Overlapping sequences are accepted. Draw the state transition diagram. | **R** | **CO4,**  **CO1, CO7** |
| 11. | **What** do you mean by inverse machine? | **R & U** | **CO5, CO6, CO7** |
| 12. | **What** do you mean by Halting problem of a Turing machine? | **R & U** | **CO5, CO6, CO7** |

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| **ECS61120** | Principles of Programming Languages (Elective -VI) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hour -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **B.Tech level Computer Programming Knowledge** | | | | |
| **Co-requisites** | **-** | | | | |

**Course Objectives:**

* To provide the knowledge of, and ability to use, language features used in current programming languages.
* To develop an ability to program in different language paradigms and evaluate their relative benefits.
* To introduce of the key concepts in the implementation of common features of programming languages.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Define** the major programming paradigms, and the principles and techniques involved in design and

implementation of modern programming languages.

CO2. **Classify** the notations to describe syntax and semantics of programming languages.

CO3. **Inspect** the behavior of simple programs in imperative languages using concepts such as binding, scope,

control structures, subprograms and parameter passing mechanisms

CO4. **Compare** the concepts of Imperative programming, Declarative programming and object oriented

programming for large scale software development.

CO5. **Develop** the application of prolog and LISP.

CO6. **Design** the concept of Formal Systematic and Functional Programming.

**Catalog Description:**

Presents examples of important programming languages and paradigms such as LISP, ALGOL, ADA, ML, Prolog, and C++. Students write sample programs in some of the languages studied. The languages are used to illustrate programming language constructs such as binding, binding times, data types and implementation, operations (assignment data-type creation, pattern matching), data control, storage management, parameter passing, and operating environment. The suitability of these various languages for particular programming tasks is also covered. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, as per requirement. The tutorials will familiarize the students with practical problem-solving techniques led by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinator.

**Course Content:**

**Unit-I 5 Lecture Hours**

**Module 1:**

**Introduction:** Programming language definition, brief history of programming

Languages, overview of programming paradigms.

**Language design principles:** Design criteria, efficiency, regularity

**Unit II: 8 Lecture Hours**

**Syntax:** Lexical structure, Context free grammar, BNF, syntax tree, parse tree, Expression syntax.

**Semantics:** Declaration, allocation, evaluation, symbol table, runtime environment, data types, type checking, weak typing, strong typing, parameter passing methods such as pass by value, pass by name, pass by result, pass by value-result, pass by reference, exceptions and exceptions handling.

**Unit III: 7 Lecture Hours**

**Garbage collection:** Advantages, explicit garbage collection, automatic garbage

Collection compacting.

**Imperative programming:** Impact of Von-Neumann architectures on programming

language, assignments, names, locations, L-value, R-value, memory allocation, scope rules, control flow, control abstraction, functions, exception handling, primitive and constructed data types, data abstraction.

**Unit IV: 10 Lecture Hours**

**Object oriented programming:** Objects, classes, methods, dynamic binding,

inheritance, polymorphism, design and implementation issues in object oriented

Languages, case study.

**Declarative programming:** Distinctive features of declarative programming, first order logic, Horn clauses, resolution unification, sequencing of control, negation,

Implementations issues, the language Prolog, constraint logic programming.

**Unit V: 10 Lecture Hours**

**Functional programming:** Distinctive features of functional programming languages, functional programming in imperative language, recursion, tail recursion, higher order functions, lazy evaluation, types in functional programming, mathematics of functional programming: lambda calculus. introduction to functional programming using Scheme Haskell ML.

**Unit VI:5 Lecture Hours**

**Brief introduction to multi-paradigm languages** (Python/Leda/Ada/C#).

**Formal semantics:** Operational semantics, denotational semantics, axiomatic semantics, proof of program correctness.

**Text Books:**

1. “Programming Languages: Principles and practice”, Kenneth C. Louden, 2003.
2. “Programming Languages and Paradigms”, D. A. Watt, Prentice-Hall, 1990.
3. “Advanced Topics in Types and Programming Languages”, Benjamin C. Pierce, ed., MIT Press, 2005.
4. “Foundations of Logic Programming”, J. Lloyd, Springer Verlag, 1984.

**Reference Books:**

1. “The Semantics of Programming Languages”, M. Hennessey, John Wiley, 1990.
2. “Elements of Functional Programming”, C. Reade, Addison Wesley, 1989.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Class Assessment** | **Mid Term** | **End Term** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Define** the major programming paradigms, and the principles and techniques involved in design and implementation of modern programming languages. | **PO1, PO2, PO3** |
| **CO2** | **Classify** the notations to describe syntax and semantics of programming languages. | **PO1, PO2** |
| **CO3** | **Inspect** the behavior of simple programs in imperative languages using concepts such as binding, scope, control structures, subprograms and parameter passing mechanisms | **PO2, PO3, PO4** |
| **CO4** | **Compare** the concepts of Imperative programming, Declarative programming and object-oriented programming for large scale software development. | **PO1, PO3, PO4** |
| **CO5** | **Develop** the application of prolog and LISP. | **PO5, PO2** |
| **CO6** | **Design** the concept of Formal Systematic and Functional Programming. | **PO1, PO3** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61120 | Principle of Programming Language (Elective -VI) | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - |

1=weakly mapped 2= moderately mapped 3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Principle of Programming Language (Elective -IV) PAPER CODE: ECS61120

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **Section A (**Answer **All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Compare** vector and list. | **U** | **CO1** |
| 2. | **Compare** any two differences between procedural and object-oriented programming paradigms. | **U** | **CO1** |
| ­­­3. | **Define** Heap storage management. | **R** | **CO4** |
| 4. | **What** are called imperative programming language? | **R** | **CO3** |
| 5. | **What** do you mean by friend class in C++? | **R** | **CO4** |
| **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** | | | |
| 6. | **Compare** between compiler and interpreter. | **U** | **CO1** |
| 7. | For the following statement of a programming language **Explain** various types of bindings and the timing when these bindings are done.  x= x+20. | **Evaluate** | **CO4** |
| 8. | **Explain** Syntax and Semantics analysis of programming language? | **U** | **CO2** |
| 9. | **Illustrate** isthe concept of virtual functions in C++? | **U** | **CO4** |
| **SECTION C (**Attempt Any **Two Questions) (2 x 10 = 20)** | | | |
| 10. | **Apply** the concept of subtype by using a C++ program. | **Ap** | **CO3** |
| 11. | **Show** about the various attributes of good programming language. | **R** | **CO1** |
| 12. | **What** are called recursive subprograms? **Explain** stack-based implementations of subprograms. | **R, Evaluate** | **CO3** |

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| **ECS61122** | High Performance Computer Architecture  (Elective -VI) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hour -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **B.Tech level Computer Programming Knowledge** | | | | |
| **Co-requisites** | **-** | | | | |

**Course Objectives:**

1. Provide systematic and comprehensive treatment of the hardware and the software high performance techniques invovled in current day computing.

2. Introduce the fundamentals of high performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.

3. Introduce the learner to fundamental and advanced parallel algorithms through the GPU and MIC programming environments

4. Provide systematic and comprehensive treatment of the components in the pipeline that extract instruction level parallelism.

5. Provide a strong foundation on memory hierarchy design and tradeoffs in both uniprocessor and multiprocessors.

6. Illustrate the cache coherence and consistency problems in multiprocessors, and their existing solutions.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1 – **Design**, formulate, solve and implement high performance versions of standard single threaded algorithms

CO2 – **Demonstrate** the architectural features in the GPU and MIC hardware accelarators.

CO3 – **Design** programs to extract maximum performance in a multicore, shared memory execution environment processor.

CO4 - **Design** and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.

**Catalog Description:**

Confidently discuss key ideas and elements of modern computer architectures, including branch prediction, out-of-order execution, cache optimizations, multi-level caches, memory, storage, reliability/availability, multi-core processors, cache coherence and consistency, and long-term and recent trends in computer architecture.

**Course Content:**

**Unit I: 5lecture hours**

**Introduction:** Review of basic computer architecture, Quantitative techniques in

**Computer design, measuring and reporting performance. CISC and RISC processors.**

**Unit II: 10 lecture hours**

**Pipelining:** Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards, and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques. Compiler techniques for improving performance. Hierarchical memory technology: Inclusion, Locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, Mapping and management techniques, Memory replacement policies.

**Unit III: 12 lecture hours**

**Instruction-level parallelism:** Basic Concepts, Techniques for increasing ILP, Dynamic scheduling (Tomasulo's Algorithm), Reorder buffer and instruction commit, Branch prediction and advanced instruction delivery, Speculative execution. Superscalar, Super pipelined and VLIW processor architectures. Array and vector processors

**Unit IV: 10 lecture hours**

**Multiprocessor architecture:** Taxonomy of parallel architectures. Centralized shared memory Architecture. Synchronization, Memory consistency, Interconnection networks. Distributed shared memory architecture. Model of memory consistency, Cache coherency, Multiprocessing snooping protocol, Multiprocessing directory protocol. Cluster computers.

**Unit IV: 8 lecture hours**

**Non von Neumann architectures:** Data flow computers, Reduction computer

Architectures, Systolic architectures. Multicore Architectures.

**Text Books:**

1. “Computer Architecture: A Quantitative Approach”, John L. Hennessy and David A. Patterson, Morgan Kaufmann.“Computer Architecture: A Quantitative Approach”, John L. Hennessy and David A. Patterson, Morgan Kaufmann.
2. “Modern Processor Design: Fundamentals of Superscalar Processors”, John Paul Shen and Mikko H. Lipasti, Tata McGraw-Hill.

**Reference Books:**

1. “Computer Architecture: Pipelined and Parallel Processor Design”, M. J. Flynn, Narosa

Publishing.

2. “Advanced Computer Architecture: Parallelism, Scalability, Programmability”, Kai Hwang, McGraw-Hill.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Design**, formulate, solve and implement high performance versions of standard single threaded algorithms | **PO1,PO2,PO3,PO5,PO6,PO12,** |
| **CO2** | **Demonstrate** the architectural features in the GPU and MIC hardware accelarators. | **PO1,PO2,PO3,PO5,PO6,PO12** |
| **CO3** | **Design** programs to extract maximum performance in a multicore, shared memory execution environment processor. | **PO1,PO3,PO5,PO12** |
| **CO4** | **Design** and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm. | **PO1,PO3,PO5,PO12** |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61122 | High Performance Computer Architecture(Elective -VI) | 3 | 2 | 3 | - | 3 | 2 | - | - | - | - | - | 3 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name:**  **Enrolment No:** | |  | | |
| **ADAMAS UNIVERSITY**  **SCHOOL OF ENGINEERING AND TECHNOLOGY**  **END-SEMESTER EXAMINATION**  **Name of the Program: M.Tech Semester: VI**  **Code- ECS61122 Stream- CSE Time: 03 Hrs.**  **Paper title– High Performance Computer Architecture(Elective -IV) Total pages- 2**  **Max. Marks: 40 Total no. of questions- 12**  **Instructions:**  Attempt All Questions from **Section A** (Each Carrying 1 Marks); any **Three Questions** from **Section B** (Each Carrying 5 Marks)**.** Any **Two Questions from Section C** (Each Carrying 10 Marks)**.**  1. **At top of sheet, clearly mention Name, Roll No., Enrolment No., Paper Name & Code, and Date of Exam.**  2. **Assumptions made if any, should be stated clearly at the beginning of your answer.**  3. **All parts of a Question should be answered consecutively.** | | | | |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | | |
| 1. | **What** do you understand by parallel processing? | | **R** | **CO1** |
| 2. | **What** is an array processor? | | **R** | **CO1** |
| ­­­ 3. | **Explain** what is pipeline computer? | | **U** | **CO2** |
| 4. | **What** are the different types of associative memory organization? | | **R** | **CO1** |
| 5. | **What** is semaphore? How is it useful? | | **R** | **CO1** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** | | | |
| 6. | **Explain** Scatter and gather operation and how it is different for one to all Broadcast and All to one reduction. Explain All to all broadcast on linear array , Mesh and Hypercube Topologies | | **U** | **CO2** |
| 7. | **State** and Explain Basic working Principle of Super scalar Processor. Define Latency and Bandwidth of memory and explain its impact on system Performance | | **Ap, R** | **CO2** |
| 8.. | **Explain** with suitable diagram SIMD , MIMD architectures. Describe Uniform memory Access and Non-Uniform Memory access with diagrammatic representation | | **U** | **CO3** |
| 9. | **State** and Explain Basic working Principle of Super scalar Processor b) Define Latency and Bandwidth of memory and explain its impact on system Performance | | **Ap, R** | **CO2** |
|  | **SECTION C (Answer Any Two Questions) (2 x 10 = 20)** | | | |
| 10 | **Explain** Static and dynamic mapping Techniques for Load Balancing. What are characteristics of tasks and interactions | | **U** | **CO3** |
| 11 | **Explain** any three decomposition techniques with suitable example . Define following terms – Granularity , Task dependency graph , Task Interaction Graph , Degree of concurrency | | **U** | **CO3** |
| 12 | **Explain** Broadcast and Reduction example for multiplying matrix with a vector. Explain Prefix Sum operation for an eight node hypercube | | **U** | **CO3** |

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| **ECS61124** | Natural Language Processing (Elective-VII) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Introduction to probability theory, statistics** | | | | |
| **Co-requisites** | **Python, prior knowledge of some machine learning algorithms and data structures is very useful.** | | | | |

**Course Objectives:**

* To understand key concepts from NLP are used to describe and analyze language
* To understand semantics and pragmatics of language for processing
* To apply structured semantic models on information retrieval and natural language applications.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Recall** linguistic phenomena and an ability to model them with formal grammars.

CO2. **Illustra**te proper experimental methodology for training and evaluating empirical NLP

systems

CO3. **Apply** natural language processing techniques to process speech and analyse text.

CO4. **Examine** algorithms of natural language processing

CO5. **Evaluate** different language modeling Techniques.

**Catalog Description:**

This course introduces the fundamental concepts and techniques of natural language

processing (NLP). Students will gain an in-depth understanding of the computational

properties of natural languages and the commonly used algorithms for processing

linguistic information. The course examines NLP models and algorithms using both the

traditional symbolic and the more recent statistical approaches.

**Course Content:**

**Unit I: 9Lecture hours**

Introduction: Context - Classical Toolkit - Text Pre-processing – Tokenization – Sentence Segmentation

Lexical Analysis: Finite State Morphonology Paradigm based Lexical Analysis - Syntactic Parsing – Cocke-Kasami-Younger Algorithm – Deductive Parsing – LR Parsing – Constraint based Grammars – Issues in Parsing

Semantic Analysis: Theories and approaches to Semantic Representation – Fine Grained Lexical

Case studies - Natural Language Generation – Components of a Generator – Approaches to Text Planning – Linguistic Component.

**Unit II: 9 Lecture hours**

Corpus Size, Representation, Sampling – Data Capture – Corpus Markup and Annotation – Multilingual Corpora – Multimodal Corpora -Corpus Annotation Types

Morphosyntactic Annotation – Treebanks: Syntactic, Semantic, and Discourse Annotation - Process of Building Treebanks - Applications of Treebanks - Searching Treebanks.

Fundamental Statistical Techniques: Binary Linear Classification – One-versus-All Method for Multi-Category Classification - Maximum Likelihood Estimation - Generative and Discriminative Models - Mixture Model and EM - Sequence Prediction Models.

Part-of-Speech Tagging: General Framework – POS Tagging Approaches – Other Statistical and Machine Learning Approaches.

Statistical Parsing: Basics - Probabilistic Context-Free Grammars - Generative Models – Discriminative Models - Beyond Supervised Parsing.

**Unit III: 9 Lecture hours**

Multiword Expressions (MWE): Linguistic Properties, Types, Classification of MWEs – Research Issues

Methods of Word Similarity – Normalized Web Distance Method – Kolmogorov Complexity – Information Distance – Normalized Web Distance – Applications –

Word Sense Inventories and Problem Characteristics – Applications of Word Sense Disambiguation – Approaches to Sense Disambiguation: Supervised, Lightly Supervised and Unsupervised.

**Unit IV: 9 Lecture hours**

Modern Speech Recognition: Architectural Components – Historical Developments – Speech Recognition Applications – Technical Challenges and Future Research Directions

Alignment: Basics – Sentence Alignment – Character, Word, Phrase Alignment – Structure and Tree Alignment – Biparsing and ITG Tree Alignment

Statistical Machine Translation: Approaches – Language Models – Parallel Corpora – Word Alignment – Phrase Library – Translation Models – Search Strategies – Research Areas.

**Unit V: 9 Lecture hours**

Information Retrieval – Indexing – IR Models – Evaluation and Failure Analysis

Natural Language Processing and Information Retrieval – Question Answering – Generic Question Answering System – Evaluation of Question Answering system – Multilingualism in Question Answering System

Recent trends and Related Works – Information Extraction – IE with Cascaded Finite State Transducers – Learning based Approaches in IE – Report generation – Emerging Applications of Natural language Generation in Information – Biomedical Text Mining – Sentiment Analysis and Subjectivity.

**Text Books:**

1. Daniel Jurafsky and James H. Martin Speech and Language Processing (2nd Edition), Prentice Hall; 2 edition, 2008

2. Foundations of Statistical Natural Language Processing by Christopher D. Manning and Hinrich Schuetze, MIT Press, 1999

**Reference Books:**

1.James Allen, Natural Language Understanding, Addison Wesley; 2 edition 1994

2.Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O’Reilly Media; 1 edition, 2009

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Recall** linguistic phenomena and an ability to model them with formal grammars. | **PO1,PO2** |
| **CO2** | **Illustrate** proper experimental methodology for training and evaluating empirical NLP systems | **PO1,PO2,PO3,PO4,PO5** |
| **CO3** | **Apply** natural language processing techniques to process speech and analyse text. | **PO1,PO2,**  **PO3,PO4** |
| **CO4** | **Examine** algorithms of natural language processing | **PO1,PO2,PO3,PO4** |
| **CO5** | **Evaluate** different language modeling Techniques. | **PO1,PO2,PO3, PO5,PO6** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  61124 | Natural Language Processing (Elective -VII) | 3 | 3 | 3 | 3 | 2 | 1 | - | - | - | ----- | - | - |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Natural Language Processing (Elective -VII) PAPER CODE: ECS61124

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 10 Total No of Pages: 01

**Instruction for the Candidate:**

1.At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.

2.All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.

3.Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Explain** the concept of Hidden Markov Model. U | **1** | **CO1** |
| 2. | **How** a natural language model is being tested? Name some packages used for NLP tasks. R | **1** | **CO3** |
| ­­­3. | Suppose a real case where you have to identify the customers to be included in a promotional campaign for maximizing response regarding a product in a textual form. **What** kind of methods would you suggest to analyze the responses? R | **1** | **CO5** |
| 4. | **Explain** the concept of Latent Semantics Indexing. Suppose we want to extract some features. Is it possible in NLP? If yes how it can be done? U | **1** | **CO5** |
| 5. | **Explain** the concept of Hidden Markov Model. U | **1** | **CO2** |
|  | **SECTION B (3 x 5 = 15)** |  | |
| 6. | **Design** a grammar that handles English-subject verb agreement. The grammar that can be handled as follows   1. She sings 2. We sing U | **5** | **CO1** |
| 7. | **What** are the major challenges in NLP? **What** is morphology? Briefly **explain** the concept of parts of speech tagging. R | **5** | **CO5** |
| 8. | **Explain** working of Information retrieval Systems with proper schematic diagram. U | **5** | **CO2** |
|  | **SECTION (2 x 10 = 20)** |  | |
| 9. | Levenshtein edit distance is the number of insertions, substitutions, or deletions required to convert to one string to other, **Explain**. U | **10** | **CO5** |
| 10. | **Define** a finite-state acceptor that accepts all strings with edit distance *l* from the target string. *Target.* R | **10** | **CO4** |

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| **ECS61128** | Internet of Things(Elective-VII) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hour-45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Basics of Microprocessor/Microcontroller** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To give a brief overview of IoT.
* To enable Basic, 1G and 2G, 3G, 3.5G, 4G (LTE) and 5G precision at workplace.
* To give the students a perspective to smart objects, Network Convergence, IoT-Standard and Characteristic.
* To enable students, study the structure of Extensible Messaging and Presence Protocol (XMPP), Advanced Message Queuing Protocol (AMQP for their profession.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Understand t**he Architecture of IoT, Security issues, Opportunities for IoT

CO2. **Effectively** analyse Concept of wireless sensor network

CO3. **Explore** Network Convergence, IoT-Standard and Characteristic.

CO4. **Precise** analysis of Sensor network architecture,

CO5. **Apply** IoT Taxonomy, System Model.

**Catalog Description:**

The [Internet of Things](https://www.sciencedirect.com/topics/social-sciences/internet-of-things) (IoT), as a new growth engine of the [information and communications technology](https://www.sciencedirect.com/topics/computer-science/information-and-communication-technologies) industry, has sparked global enthusiasm. However, academic deliberation has concentrated on technological aspects, discounting the multifaceted nature of IoT. Therefore, we reviewed non-technical and technical domain to examine the current status of IoT discourse and applied analytic hierarchy process models to assess the priorities for future IoT research.

**Course Content:**

**Unit I: 2 lecture hours**

Introduction: What is IoT and the connected world?

Architecture of IoT, Security issues, Opportunities for IoT

**Unit II: 4 lecture hours**

**Wireless Communication**

Wireless Communication –Basic, 1G and 2G, 3G, 3.5G, 4G (LTE) and 5G

**Unit III: 2 lecture hours**

**Wireless Sensor Networks**

Concept of wireless sensor network, Chronology of sensor node, Senor network architecture,

Taxonomy, System Model.

**Unit IV: 6 lecture hours**

**Architecture**

IoT built from smart objects, Network Convergence, IoT-Standard and Characteristic,

Outline of Architecture, Opportunities in IoT, Architectural Components and its mapping into protocols.

**Unit V: 8 lecture hours**

**Wireless Standards**

What are Wireless Standards? Network and Device Layer Protocol, Routing Protocol for Low Power and Lossy Networks (RPL), 6LowPAN, IEEE 802.15.4, Bluetooth Low Energy (BLE), LTE.

**Unit VI: 10 lecture hours**

**Middleware layer Protocol**

multicast DNS (mDNS), DNS Service Discovery (DNS-SD)

**Application Layer Protocol**

Constrained Application Protocol (CoAP), Message Queuing Telemetry Transport (MQTT),

Extensible Messaging and Presence Protocol (XMPP), Advanced Message Queuing Protocol (AMQP).

**Unit VII: 13 lecture hours**

**Localization, Data Storage (Big Data), Web of Things (WoT) and Security**

Localization:

Localization algorithms, Indoor localization, Localization for mobile systems, Applications,

Data Storage (Big Data): Managing high rate sensor data, Processing data streams, Data consistency in an intermittently connected or disconnected environment, Identifying outliers and anomalies.

Security: Why is security for IoT so hard? Threat models; Defensive strategies and examples

**Applications**

Smart health; Home automation; Location tracking

**Text Books:**

1. Internet of Things (IoT): Technologies, Applications, Challenges and Solutions-

BK Tripathi (Editor), J Anuradha (Editor), CRC press, 2018

2. The Internet of Things, S. Greengard, MIT Press, 2015, 1st Edition

**Reference Books:**

1. Ala Al-Fuqaha et al., "Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications", IEEE Communication Surveys & Tutorials, Vol. 17, No. 4, Fourth Quarter 2015, pp 2347-76

2. S. M. RIAZUL ISLAM et al., "The Internet of Things for Health Care: A Comprehensive Survey", IEEE Access, Jun 2015, pp678-08

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Understand** the Architecture of IoT, Security issues, Opportunities for IoT. | **PO1, PO11, PO10** |
| **CO2** | **Effectivelyanalyse**Concept of wireless sensor network. | **PO1, PO2, PO3, ,PO10** |
| **CO3** | **Explore** Network Convergence, IoT-Standard and Characteristic. | **PO1, PO2, PO3, PO4, PO5, PO7, PO10,PO11,PO12** |
| **CO4** | **Precise** analysis of Sensor network architecture. | **PO1, PO6, PO8, PO9, PO12** |
| **CO5** | **Expound** IoT Taxonomy, System Model for smart infrastructure. | **PO1, PO6, PO8, PO9, PO12,** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  61128 | Internet of Things(Elective -VII) | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 3 | 2 | 3 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Internet of Things(Elective-VII) PAPER CODE: ECS61128

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

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| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **List** the steps involved in Architecture of IoT | **U** | **CO1** |
| 2. | **Enumerate** the basic elements of wireless sensor network | **U** | **CO2** |
| ­­­ 3. | **Define** Extensible Messaging and Presence Protocol (XMPP), | **R** | **CO3** |
| 4. | **What** is multicast DNS (mDNS),? | **R** | **CO4** |
| 5. | **Give** the principles of Localization for mobile systems. | **U** | **CO3** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Describe** the characteristics of Constrained Application Protocol (CoAP), Message Queuing Telemetry Transport (MQTT),  . | **U** | **CO1** |
| 7. | **Examine** Why is security for IoT so hard? And **its Inference** with your own example. | **U,Ap** | **CO1,CO2** |
| 8. | **Elucidate** the factors influencing IoT security. | **Ap** | **CO3** |
| 9. | **Explain** with Example: i) Smart healthcare ii) Reliability Coefficient of smart city. | **Evaluate** | **CO4 /CO5** |
|  | **SECTION (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Explain** in detail about Home automation. | **U** | **CO4** |
| 11. | **Write** a Quality Control **Plan** for the Managing high rate sensor data, Processing data streams. | **Create** | **CO4** |
| 12. | **Distinguish** Data consistency in an intermittently connected or disconnected environment. | **An** | **CO5** |

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| **MBA61142** | E-Commerce (Elective -VII) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Basic marketing knowledge.** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* Course introduces the concepts and methods required for the construction of large software intensive systems.
* It aims to develop a broad understanding of the discipline of software engineering.
* It seeks to complement this with a detailed knowledge of techniques for the analysis and design of complex software intensive systems. It aims to set these techniques in an appropriate engineering and management context.
* It provides a brief account of associated professional and legal issues.

**Course Outcomes:**

On the successful completion of the course, students will be able to

1. **Explain** the understanding of the foundations and importance of E-commerce
2. **Demonstrate** an understanding of retailing in E-commerce by:
3. **Analyse** the impact of E-commerce on business models and strategy
4. **Explain** Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational.
5. **Explain** the key features of Internet, Intranets and Extranets and explain how they relate to each other.
6. **Discuss** legal issues and privacy in E-Commerce
7. **Analyse** electronic payment systems and discuss global E-commerce issues

**Catalog Description:**

Presents concepts and skills for the strategic use of e-commerce and related information technology from three perspectives: business to consumers, business-to-business, and intra-organizational. Examination of e-commerce in altering the structure of entire industries, and how it affects business processes including electronic transactions, supply chains, decision making and organizational performance.

**Course Content:**

**Unit I: 7 lecture hours**

E-commerce: The revolution is just beginning, Ecommerce: A Brief History, Understanding E-commerce: organizing Themes

**Unit II: 16 lecture hours**

E-commerce Business Models, Major Business to Consumer (B2C) business models, Major Business to Business (B2B) business models, Business models in emerging E-commerce areas, How the Internet and the web change business: strategy, structure and process, The Internet: Technology Background, The Internet Today, Internet II- The Future Infrastructure, The World Wide Web, The Internet and the Web : Features

**Unit III: 10 lecture hours**

Building an E-commerce Web Site: A systematic Approach, The e-commerce security environment, Security threats in the e-commerce environment, Technology solution, Management policies, Business procedures, and public laws, Payment system, E-commerce payment system, Electronic billing presentment and payment

**Unit IV: 12 lecture hours**

Consumer online: The Internet Audience and Consumer Behaviour, Basic Marketing Concepts, Internet Marketing Technologies, B2C and B2B E-commerce marketing and business strategies, The Retail sector, Analyzing the viability of online firms, E-commerce in action: E-tailing Business Models, Common Themes in online retailing, The service sector: offline and online, Online financial services, Online Travel Services, Online career services

**Text Books:**

1. Kenneth C. Laudon, E-Commerce : Business, Technology, Society, 4th Edition, Pearson .

**Reference Books:**

1. S. J. Joseph, E-Commerce: an Indian perspective, PHI

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Class Assessment** | **Mid Term** | **End Term** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and Pos** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Explain** the understanding of the foundations and importance of E-commerce | **PO2, PO3** |
| **CO2** | **Demonstrate** an understanding of retailing in E-commerce by: | **PO1, PO4** |
| **CO3** | **Analyse** the impact of E-commerce on business models and strategy | **PO3, PO6, PO11** |
| **CO4** | **Explain** Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational. | **PO9, PO11** |
| **CO5** | **Explain** the key features of Internet, Intranets and Extranets and explain how they relate to each other. | **PO3, PO12** |
| **CO6** | **Discuss** legal issues and privacy in E-Commerce | **PO6, PO9** |
| **CO7** | **Analyse** electronic payment systems and discuss global E-commerce issues | **PO1, PO2** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| MBA61142 | E-Commerce (Elective -VII) | 2 | 2 | 3 | 1 | - | 2 | - | - | 2 | - | 2 | 1 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION**

Name of the Program: M.Tech Semester: II Stream: CSE

PAPER TITLE: E-Commerce (Elective-VII) PAPER CODE:MBA61142

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **What** is the full form of NEFT? | **R** | **CO1** |
| 2. | **Explain** E-bill presentment and payment. | **U** | **CO3** |
| ­­­ 3. | **Define** company policies. | **U&R** | **CO4** |
| 4. | **Explain** CIA of smart card. | **R** | **CO1, CO2** |
| 5. | **What** is B2B model? | **R & U** | **CO5** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Analyze** the major differences between Traditional brick and Mortar Commerce and E-Commerce? Explain these differences with suitable example. | **Ap** | **CO3** |
| 7. | **Describe** the major differences between B2B and B2C Models of E-Commerce with an example. | **U & C** | **CO2, CO6** |
| 8. | **What** are the factors that led to the use of the Internet, as an Enabling Technology for E-Commerce? Explain these factors with suitable example. | **An** | **CO5** |
| 9. | **Compare** between E-commerce and Traditional Commerce? | **R & U** | **CO7** |
|  | **SECTION C(Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Explain** the required features of the B-to-B Model of E-Commerce with suitable examples. | **R** | **CO4,**  **CO1, CO2** |
| 11. | **What** are the Technology advancement to empower E-Commerce? Explain these advancements with examples. | **R & U** | **CO6** |
| 12. | **Explain** the advantages to society because of e-commerce? | **R & U** | **CO5** |

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| **ECS61302** | Seminar -II | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hour-30** | **0** | **2** | **0** | **2** |
| **Pre-requisites/Exposure** | **Knowledge on Computer domain** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To develop skills in doing literature survey, technical presentation and report preparation.
* To enable project identification and execution of preliminary works on final semester project

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Identify** the advanced technologies and globalization

CO2. **Develop** communication and representation skills towards becoming a good team leader and

manager

CO3. **Plan** for lifelong learning towards industry readiness

CO4. **Build** the ability to identify an engineering problem, analyze it and propose a work plan to

solve it.

**Catalog Description:**

The course involves presentation and report submission by every student. Reference search and technical writing skills along with effective presentation skills are focused. The course strengthens the research attributes including literature survey.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Identify** the advanced technologies and globalization | **PO1, PO2, PO3** |
| **CO2** | **Develop** communication and representation skills towards becoming a good team leader and manager | **PO9, PO10** |
| **CO3** | **Plan** for lifelong learning towards industry readiness | **PO1, PO12** |
| **CO4** | **Build** the ability to identify an engineering problem, analyze it and propose a work plan to solve it. | **PO1, PO2, PO3, PO4, PO5, PO6** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  61302 | Seminar -II | 3 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | - | 1 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ECS61202** | **Computing Lab –II** | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours- 45** | **0** | **0** | **3** | **2** |
| **Pre-requisites/Exposure** | **C Programming** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To formulate and evaluate a hypothesis by proposing, implementing and testing a project.
* To relate one project to prior research via a review of related literature.
* To understand the fundamental questions in parallel and distributed computing and analyze different solutions to these questions.
* To understand different parallel and distributed programming paradigms and algorithms, and gain practice in implementing and testing solutions using these.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Build** a communication between two sockets over a network.

CO2. **Apply** the basic concept of python programming and to **construct** a real-life application.

CO3. **Develop** a client server communication between multiple computing systems.

CO4. **Examine** different library and tools associated with python.

**Catalog Description:**

This course covers the architecture and enabling technologies of parallel and distributed computing systems and their innovative applications. We will cover scalable multiprocessors,

distributed clusters, P2P networks, computational Grids, virtual machines, and Internet Clouds. Case studies include IBM BlueGene/L, Google search-engine, TeraGrid, e-Science, DataGrid, Gnuttela, BitTorrent, content-delivery networks, VM Monitors, IBM BlueCloud, Amazon Elastic Clouds, Google Clouds, etc. The course aims to acquaint Master and Ph.D. students in computer science, electrical and computer engineering with state-of-the-art supercomputers and distributed computing systems for high-performance computing, e-commerce, and web-scale Internet applications.

**Course Content:**

**Experiment 1:**

Familiar Socket programming.

**Experiment 2:**

Database creation and update.

**Experiment 3:**

Building large client server applications.

**Experiment 4:**

Basics of compiler writing using lex and yacc.

**Experiment 5:**

Introduction to python Object, varibles and data types.

**Experiment 6:**

Introduction to duck typing, equality vs. identity testing.

**Experiment 7:**

Introduction to Additional useful string methods

**Experiment 8:**

String formatting, running Python as a script

**Experiment 9:**

The basics of imports, Data Structures, Functions, Functional Programming

**Experiment 10:**

Object-Oriented Python, Standard Library, Third-Party Tools.

**Text Books:**

1.“Python Cookbook: Recipes for Mastering Python 3” by Brian K. Jones and David M. Beazley.

**Reference Books:**

1.“Programming Python” by Mark Lutz.

2.“How to think like a computer scientist: Learning with Python” by Allen B. Downey.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (Cos) and Program Outcomes (Pos)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and Pos** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Build** a communication between two sockets over a network. | **PO2,PO3** |
| **CO2** | **Apply** the basic concept of python programming and to **construct** a real-life application. | **PO1,PO3** |
| **CO3** | **Develop** a client server communication between multiple computing systems. | **PO1, PO2,PO3,PO4,PO6** |
| **CO4** | **Examine** different library and tools associated with python. | **PO1, PO2,PO5, PO6** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS61202 | Computing Lab –II | 3 | 3 | 3 | 1 | 1 | 2 | - | - | - | - | - | - |

1=weakly mapped 2= moderately mapped 3=strongly mapped

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: II Stream: CSE

PAPER TITLE: Computing Lab –II PAPER CODE: ECS61202

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 02

**Instruction for the Candidate:**

1.At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.

2.All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.

3.Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 8 = 40)** | | | |
| 1. | **Develop** a Chat program between to computing facility using python? | **AP** | **CO2** |
| 2. | **Develop** the following program.  There's a staircase with N steps, and you can climb 1 or 2 steps at a time. Given N, write a function that returns the number of unique ways you can climb the staircase. The order of the steps matters.  For example, if N is 4, then there are 5 unique ways:  1, 1, 1, 1  2, 1, 1  1, 2, 1  1, 1, 2  2, 2  What if, instead of being able to climb 1 or 2 steps at a time, you could climb any number from a set of positive integers X? For example, if X = {1, 3, 5}, you could climb 1, 3, or 5 steps at a time. Generalize your function to take in X. | **AP** | **CO4** |
| ­­­ 3. | **Develop** the following program  “I am not in danger, Skyler. I am the danger. A guy opens his door and gets shot, and you think that of me? No! I am the one who knocks!”  Skyler fears Walter and ponders escaping to Colorado. Walter wants to clean his lab as soon as possible and then go back home to his wife.  In order clean his lab, he has to achieve cleaning level of lab as Y. The current cleaning level of the lab is X.  He must choose one positive odd integer a and one positive even integer b. Note that, he cannot change a or b once he starts cleaning.  He can perform any one of the following operations for one round of cleaning:  Replace X with X+a.  Replace X with X−b.  Find minimum number of rounds (possibly zero) to make lab clean. Input:  * First line will contain TT, number of test cases. TT testcases follow : * Each test case contains two space separated integers X,YX,Y.  Output: For each test case, output an integer denoting minimum number of rounds to clean the lab. Constraints  * 1≤T≤1051≤T≤105 * |X|,|Y|≤109|X|,|Y|≤109  Sample Input: 3  0 5  4 -5  0 10000001 Sample Output: 1  2  1 | **AP** | **CO3** |
| 4. | **Develop** the following program  Princess Rupsa saw one of her friends playing a special game. The game goes as follows:   * **N+1** numbers occur sequentially (one at a time) from **A0** to **AN**. * You must write the numbers on a sheet of paper, such that **A0** is written first. The other numbers are written according to an inductive rule — after **Ai-1**numbers have been written in a row, then **Ai** can be written at either end of the row. That is, you first write **A0**, and then **A1** can be written on its left or right to make **A0A1** or **A1A0**, and so on. * **Ai** must be written before writing **Aj**, for every **i < j**. * For a move in which you write a number **Ai (i>0)**, your points increase by the product of **Ai** and its neighbour. (Note that for any move it will have only one neighbour as you write the number at an end). * Total score of a game is the score you attain after placing all the **N + 1**numbers.   Princess Rupsa wants to find out the sum of scores obtained by all possible different gameplays. Two gameplays are different, if after writing down all **N + 1**numbers, when we read from left to right, there exists some position **i**, at which the gameplays have **aj** and **ak** written at the **ith** position such that **j ≠ k**. But since she has recently found her true love, a frog Prince, and is in a hurry to meet him, you must help her solve the problem as fast as possible. Since the answer can be very large, print the answer modulo **109 + 7**. Input  * The first line of the input contains an integer **T** denoting the number of test cases. * The first line of each test case contains a single integer **N**. * The second line contains **N + 1** space-separated integers denoting **A0** to **AN**.  Output  * For each test case, output a single line containing an integer denoting the answer.  Constraints  * **1** ≤ **T** ≤ **10** * **1** ≤ **N** ≤ **105** * **1** ≤ **Ai** ≤ **109**  Sub tasks  * Subtask #1: 1 ≤ **N** ≤ 10 (10 points) * Subtask #2: 1 ≤ **N** ≤ 1000 (20 points) * Subtask #3: Original Constraints (70 points)  Example **Input:**  2  1  1 2  2  1 2 1  **Output:**  4  14 | **AP** | **CO1** |
| 5. | **Develop** the following program  2 Milkmen Aditya and Rahul were doing very good business in their village as partners and had many milk containers of the following sizes.  The codes for each of the sizes are given in the braces they are supposed to be entered in the input as specified in INPUT section.  Can (CN) 10 gallons  Pail (PL) 2 gallons  Gallon (G)  Quart (Q) 1/4 gallon  Pint (PN) 1/8 gallon  Cup (CP) 1/16 gallon  Now Rohan who lives in the same village took up a assignment to know in how many ways can the milkmen store X gallons of milk using any combination of these containers. For instance, the milkmen can store one Quart four ways:  1: 1 quart  2: 2 pints  3: 1 pint + 2 cups  4: 4 cups  One gallon can be stored 26 different ways.  In all data, X is a positive integer number and 1 <= X gallons <= 50. Rohans program must compute the number of combinations for each separate input value in less than ten seconds (which means that your program might run as long as 10\*n seconds for n input values). Input Your program should read values from the file first the Quantity and then followed by the code for each of the sizes as specified above in the second line (and compute and print the number of combinations) until encountering a value of #. Output Your output should give the number of ways specified for the input.  An example is given below:  **Sample Input**  1  G  #  **Sample Output**  26 | **AP** | **CO2** |

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| **ECS62101** | **Cryptography & Cryptosystems**  **(Elective-VIII)** | **L** | **T** | **P** | **C** |
| **Version 1.1** | **Contact hour-45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Computer Network, Engineering Mathematics** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To understand of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
* To demonstrate the familiarity with prevalent network and distributed system attacks, defences against them, and forensics to investigate the aftermath.
* To appraise a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
* To Examine security policies (such as authentication, integrity and confidentiality), as well as protocols to
* To evaluate such policies in the form of message exchanges.

**Course Outcomes:**

On completion of this course students will be able to:

CO1**. Define** the basics of OSI security model and Classical Encryption Technique.

CO2**. Understand** and identify the application of Public Key Encryption Techniques and practices.

CO3**. Demonstrate** the application of Data Authentication and Authorization..

CO4**. Examine** the basics concept of Network Security and Web Security..

CO5**. Appraise** the recent threats and attacks against the technical world and design some effective prevention scheme.

**Catalog Description:**

Information Technology systems need to ensure the confidentiality, integrity, and availability of information. This course introduces students the principles of network and operating system security through hands-on exploration. Students learn how to harden an operating system as well as secure the network by implementing technologies such as firewalls, Virtual Private Networks (VPN), and Intrusion Detection Systems (IDS).

**Course Content:**

**Unit I: 10 lecture hours**

**Mathematical Preliminaries:**Modular arithmetic, Division theorem, Equivalence relation, Residue class, GCD and its properties, Euler-Toient Function, Fermat’s Little Theorem, Groups, Abelian Groups, Monoids, Group isomorphisms, Ring, Field, Prime and Galois Field, Binary field, Isomorphic field mappings in GF(24 ) multiplication, Finite Fields and their Irreducible Polynomials, Composite Fields

**Unit II: 9 lecture hours**

**Analyzing Unconditional Security:**Plaintext Distribution, Key Distribution, Ciphertext Distribution, Attacker’s Probabilities, Condition for Perfect Secrecy, Mechanism of Twisted Shift Cipher, Shannon’s Theorem, One Time Pad (Verman’s Cipher), Limitations of Perfect Secrecy.

**Quantification of Information:**Entropy, Entropy and Coding, Measurement of the Redundancy in a Language, Conditional Entropy, Joint Entropy, Entropy and Encryption, Unicity Distance.

**Classical Cryptosystems :** Ciphers, Symmetric Algorithms, Asymmetric Algorithms, Encryption, Attacker’s Capabilities, Kerckhoff’s Principle for cipher design, Shift Cipher, Substitution Cipher, Polyalphabetic Ciphers, Vigenère Cipher, Affine Cipher, Hill Cipher, Permutation Cipher, Block Ciphers, Stream Ciphers, Product Ciphers, Affine Cipher, Idempotent Ciphers, Iterative Cipher.

**Unit III: 10 lecture hours**

**Public key Cryptosystems:** One Way Functions, Trapdoor One Way Function, RSA Algorithm, RSA Encryption and Decryption, Software Implementation of RSA Algorithm using Multi-precision Arithmetic(Multi-precision Addition, Multi-precision Subtraction, Multi-precision Multiplication using Karatsuba’s Algorithm, Test for Primes, Great Internet Mersenne Prime Search, Primality Tests with Trial Division, Randomized Algorithms for Primality Testing using Monte-carlo method, Finding Large Primes (using Fermat’s Theorem), Fermat’s Primality Test and its limitation, Strong probable-primality test, Miller-Rabin Primality Test, Miller-Rabin Algorithm (test for composites), Quadratic Residues, Legendre Symbol, Euler’s Criteria, Quadratic Non Residue, SolovayStrassenPrimality Test, Jacobi Symbol and its properties, Digital Signatures, Digital Certificates

**Unit IV: 10 lecture hours**

**Elementary Concepts of Coding Theory :** Basic assumptions about channels (Code length preservation, Independence of errors) , Basic strategy for decoding (maximal likehood principle, nearest neighbour decoding strategy etc.), Hamming distance and its properties, Basic error correcting theorem, Binary symmetric channel, parity-check bit, two-dimensional parity code, Hadamard code, International Standard Book Number (ISBN)-code, Single error detection, Transposition detection, Equivalence of codes, Criteria for good code, The sphere-packing or Hamming bound, Gilbert-Varshanov bound, Huffman's code, Applications of Algebraic Coding Theory to Cryptography

**Unit V: 6 lecture hours**

**Elliptic Curves Theory and Applications to Factorization :** [Elliptic curve Diffie–Hellman](https://en.wikipedia.org/wiki/Elliptic_curve_Diffie%E2%80%93Hellman) (ECDH) key agreement scheme, Elliptic Curve [Integrated Encryption Scheme](https://en.wikipedia.org/wiki/Integrated_Encryption_Scheme) (ECIES), [Elliptic Curve Digital Signature Algorithm](https://en.wikipedia.org/wiki/Elliptic_Curve_DSA) (ECDSA), deformation scheme using Harrison's p-adic Manhattan metric,  [Edwards-curve Digital Signature Algorithm](https://en.wikipedia.org/wiki/EdDSA) (EdDSA), Elliptic Curve Menezes–Qu–Vanstone (ECMQV) key agreement scheme is based on the Menezes–Qu–Vanstone ([MQV](https://en.wikipedia.org/wiki/Menezes%E2%80%93Qu%E2%80%93Vanstone)) key agreement scheme, Elliptic Curve Qu-Vanstone (ECQV) implicit certificate scheme

**Text Books:**

* + - 1. "Cryptography Theory and Practice", Douglas Stinson, 2nd Edition, Chapman & Hall/CRC
      2. Cryptography & Network Security", B. A. Forouzan, Tata McGraw Hill.
      3. "Modern Cryptography, Theory & Practice", Wenbo Mao, Pearson Education

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Define** the basics of OSI security model and Classical Encryption Technique. | **PO1,PO2** |
| **CO2** | **Understand** and identify the application of Public Key Encryption Techniques and practices. | **PO1.PO2** |
| **CO3** | **Demonstrate** the application of Data Authentication and Authorization. | **PO1,PO5** |
| **CO4** | **Examine** the basics concept of Network Security and Web Security. | **PO2** |
| **CO5** | **Appraise** the recent threats and attacks against the technical world and design some effective prevention scheme. | **PSO3,PO5, P07** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Computational Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex computing problems | Modern tool usage | Professional Ethics | Life-long Learning | Project Management and Finance: | Communication Efficacy | Societal & Environmental Concern: | Individual & Team Work | Innovation and Entrepreneurship |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  62101 | Cryptography & crypto systems (Elective-VIII) | 3 | 3 | 1 | - | 2 | - | 1 | - | - | - | - | - |

1=weakly mapped 2= moderately mapped 3=strongly mapped

**Model Question Paper**



**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M.Tech Semester: III Stream: CSE

PAPER TITLE: Cryptography & Cryptosystems (Elective-VIII) PAPER CODE: ECS62101

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Describe** the OpenSSL and Stunnel. | **U** | **CO1** |
| 2. | **Explain** the HTC-Hydra. . | **Evaluate** | **CO1** |
| 3. | **Describe** Cyber Crimes. | **U** | **CO1** |
| 4. | **Explain** Digital Forensics. | **Evaluate** | **CO2** |
| 5. | **Describe**Contaminants and Destruction of Data. | **U** | **CO2** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Write**Firewalls and Packet Filters. | **Ap** | **CO1** |
| 7. | **Examine**Steganography. | **Ap** | **CO2** |
| 8. | **Describe** DOS and DDOS attack. | **U** | **CO6** |
| 9. | **Describe** with Example: i) XSS attack ii) SQL injection. | **U** | **CO3, CO5** |
|  | **SECTION C (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Write** the steps of IT assessments or audits | **Ap** | **CO2** |
| 11. | **Write** the steps of Cross-site scripting (XSS). | **Ap** | **CO4** |
| 12. | **Describe** SQL injection and Cross-Site Request Forgery (CSRF) in details. | **U** | **CO3** |

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| --- | --- | --- | --- | --- | --- |
| **ECS62103** | Information Security( Elective-VIII) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Cryptography, Cyber Security, Computer Network, Cloud Computing** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To understand of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
* To demonstrate the familiarity with prevalent network and distributed system attacks, defences against them, and forensics to investigate the aftermath.
* Appraise a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.

**Course Outcomes:**

On completion of this course students will be able to:

CO1**. Define** the basics of OSI security model and Classical Encryption Technique.

CO2**. Understand** and identify the application of Public Key Encryption Techniques and practices.

CO3**. Demonstrate** the application of Data Authentication and Authorization.

CO4**. Examine** the basics concept of Network Security and Web Security.

CO5**. Appraise** the recent threats and attacks against the technical world and design some effective prevention scheme.

**Course Description:**

Information Technology systems need to ensure the confidentiality, integrity, and availability of information. This course introduces students the principles of network and operating system security through hands-on exploration. Students learn how to harden an operating system as well as secure the network by implementing technologies such as firewalls, Virtual Private Networks (VPN), and Intrusion Detection Systems (IDS).

**Course Content:**

**Unit I: 9 lecture hours**

Information Security and its necessity: Basics Principles of Confidentiality, Integrity Availability Concepts Policies, procedures, Guidelines, Standards, Administrative Measures and Technical Measures.

Basics of Cloud Computing, Application of Cloud.

Information Security issues in Cloud Computing: Benefits and major issues related to information Security.

**Unit II: 9 lecture hours**

Standards available for Information Securities : A brief overview on Cobit, Cadbury, ISO 27001, Open Web Application Security Project (OWASP), Open Source Security Testing Methodology Manual (OSSTMM) etc. , Certifiable Standards.

Vulnerability, Threat and Remedies: Introduction to BCP / DRP / Incident management, Segregation and Separation of Duties & Roles and responsibilities, IT ACT 2000.

**Unit III: 9 lecture hours**

Information Security Assessments : Vulnerability Assessment and Penetration Testing (VAPT), Web Application Audits, IT assessments or audits, Assessment of Network Equipment, Assessment of Security Devices (Web Filtering, Firewalls, IDS / IPS, Routers etc.), Data Centre Assessment, Business Continuity and Disaster Recovery Plans (BCP/DRP) assessments

**Unit IV: 9 lecture hours**

Security of Application Software: SAP Security, Desktop Security, RDBMS Security.

Inbuilt Securities Provided in Windows and Linux : Types of audits in Windows environment, Server Security, Security for active directories (Group Policy), AntiVirus, Malware, End point protection, Shadow Passwords, SUDO (Super-user do) users etc.

**Unit V: 9 lecture hours**

Security issues in Web Application: Open Web Application Security Project (OWASP), Cross-site scripting (XSS), SQL injection, Cross-Site Request Forgery (CSRF), Password Vulnerabilities, Password Vulnerabilities, Completely Automated Public Turing test to tell Computers and Humans Apart (CAPTCHA), Session Hijacking, Local and Remote File Inclusion, Audit Trails, Web Server Issues, etc

**Text Books:**

1. “ The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws”, Dafydd Stuttard, Marcus Pinto, Wiley

2. “ Hacking: The Art of Exploitation”, Jon Erickson, 2nd edition, No Starch Press

**Reference Books:**

1. “Exploiting Software - How to Break Code”, Greg Hoglund and Gary McGraw, Addison Wesley

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Define** the basics of OSI security model and Classical Encryption Technique. | **PO1,PO2** |
| **CO2** | **Understand** and identify the application of Public Key Encryption Techniques and practices. | **PO1,PO2** |
| **CO3** | **Demonstrate** the application of Data Authentication and Authorization. | **PO1,PO5** |
| **CO4** | **Examine** the basics concept of Network Security and Web Security. | **PO2, PO3** |
| **CO5** | **Appraise** the recent threats and attacks against the technical world and design some effective prevention scheme. | **PO5** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Computational Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex computing problems | Modern tool usage | Professional Ethics | Life-long Learning | Project Management and Finance: | Communication Efficacy | Societal & Environmental Concern: | Individual & Team Work | Innovation and Entrepreneurship |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  62103 | Information Security (Elective-VIII) | 3 | 3 | 1 | - | 2 | - | - | - | - | - | - | - |

1=weakly mapped 2= moderately mapped 3=strongly mapped

**Model Question Paper**

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**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M.Tech Semester: III Stream: CSE

PAPER TITLE: Information Security (Elective -VIII) PAPER CODE: ECS62103

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Describe** the Threat and Vulnerability with examples. | **U** | **CO1** |
| 2. | **Explain** the Cloud Computing Structure. | **Evaluate** | **CO1** |
| ­­­ 3. | **Describe** the Email Security Process | **U** | **CO1** |
| 4. | **Explain** the nature of Virus. | **Evaluate** | **CO2** |
| 5. | **Describe**Security of Application Software. | **U** | **CO2** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Write**Inbuilt Securities Provided in Windows and Linux | **Ap** | **CO1** |
| 7. | **Examine**Open Web Application Security Project (OWASP) | **Ap** | **CO2** |
| 8. | **Describe** the various malware in details. | **U** | **CO6** |
| 9. | **Describe** with Example: i) XSS attack ii) Sql injection | **U** | **CO3, CO5** |
|  | **SECTION C (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Write** the steps of IT assessments or audits | **Ap** | **CO2** |
| 11. | **Write** the steps of Cross-site scripting (XSS). | **Ap** | **CO4** |
| 12. | **Describe** SQL injection and Cross-Site Request Forgery (CSRF) in details. | **U** | **CO3** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ECS62105** | Cyber Security (Elective -VIII) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours -45** | **3** | **0** | **0** | **3** |
| **Pre-requisites/Exposure** | **Cryptography** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To understand of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
* To demonstrate the familiarity with prevalent network and distributed system attacks, defences against them, and forensics to investigate the aftermath.
* To appraise a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
* To Examine security policies (such as authentication, integrity and confidentiality), as well as protocols to
* To evaluate such policies in the form of message exchanges.

**Course Outcomes:**

On completion of this course students will be able to:

CO1.**Interpret**the basics of System and Network Vulnerability Scanning.

CO2**. Demonstrate** and practice the application of Network Protection tools.

CO3. **Appraise** the application of different types of tools against web vulnerabilities.

CO4. **Examine**Cyber Crime and Law.

CO5**. Evaluate** Cyber Crime Investigation.

**Catalog Description:**

Information Technology systems need to ensure the confidentiality, integrity, and availability of information. This course introduces students the principles of network and operating system security through hands-on exploration. Students learn how to harden an operating system as well as secure the network by implementing technologies such as firewalls, Virtual Private Networks (VPN), and Intrusion Detection Systems (IDS).

**Course Content:**

**Unit I 9 lecture hours**

**Systems Vulnerability Scanning:** Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit.

**Networks Vulnerability Scanning:** Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – N map, THC-A map and System tools. **Network Sniffers and Injection tools:** Tcp dump and Win dump, Wireshark, Ettercap

**Unit II: 9 lecture hours**

**Network Protection tools :** Firewalls and Packet Filters, Firewall Basics, Comparison between Packet Filter and Firewall, Protection mechanism of Firewall, Packet Characteristic to Filter, Stateless and Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, [Snort - Network Intrusion Detection and Prevention System](https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwj9l-_K7_jTAhUNTo8KHdCTAhgQFggnMAA&url=https%3A%2F%2Fwww.snort.org%2F&usg=AFQjCNGcM-QbwviBIcCdsQyHnySpBKzvDA&sig2=PM8STvgTGHcJLMM-FJ_TQg)

**Unit I 9 lecture hours**

**Protection tools against web vulnerabilities:** Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sql map, Damn Vulnerable Web App (DVWA), Webgoat

**Password Cracking and Brute-Force Tools:** John the Ripper, L0htcrack, Pwdump, HTC-Hydra

**Unit IV: 9 lecture hours**

**Cyber Crime and law:** Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000. 10

**Unit V: 9 lecture hours**

**Cyber Crime Investigation :** Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

**Text Books:**

1." Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Nina Godbole and SunitBelpure, Publication Wiley

2." Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Nina Godbole and SunitBelpure, Publication Wiley

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Interpret**the basics of System and Network Vulnerability Scanning. | **PO1** |
| **CO2** | **Demonstrate** and practice the application of Network Protection tools. | **PO1** |
| **CO3** | **Appraise** the application of different types of tools against web vulnerabilities. | **PO5** |
| **CO4** | **Examine**Cyber Crime and Law. | **PO2** |
| **CO5** | **Evaluate**Cyber Crime Investigation**.** | **PO2, PO3, PO7** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Computational Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex computing problems | Modern tool usage | Professional Ethics | Life-long Learning | Project Management and Finance: | Communication Efficacy | Societal & Environmental Concern: | Individual & Team Work | Innovation and Entrepreneurship |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  62105 | Cyber Security (Elective-VIII) | 2 | 2 | 1 | - | 1 | - | 1 | - | - | - | - | - |

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Model Question Paper**



**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**END-SEMESTER EXAMINATION: JULY 2020**

Name of the Program: M. Tech Semester: III Stream: CSE

PAPER TITLE: Cyber Security (Elective-VIII) PAPER CODE: ECS62105

Maximum Marks: 40 Time duration: 3 hours

Total No of questions: 12 Total No of Pages: 01

**Instruction for the Candidate:**

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Section A (Answer All the Questions) (5 x 1 = 5)** | | | |
| 1. | **Describe** the OpenSSL and Stunnel. | **U** | **CO1** |
| 2. | **Explain** the HTC-Hydra. . | **Evaluate** | **CO1** |
| 3. | **Describe** Cyber Crimes. | **U** | **CO1** |
| 4. | **Explain** Digital Forensics. | **Evaluate** | **CO2** |
| 5. | **Describe**Contaminants and Destruction of Data. | **U** | **CO2** |
|  | **SECTION B (**Attempt any **Three Questions) (3 x 5 = 15)** |  | |
| 6. | **Write**Firewalls and Packet Filters. | **Ap** | **CO1** |
| 7. | **Examine**Steganography. | **Ap** | **CO2** |
| 8. | **Describe** DOS and DDOS attack. | **U** | **CO6** |
| 9. | **Describe** with Example: i) XSS attack ii) SQL injection. | **U** | **CO3, CO5** |
|  | **SECTION C (Answer Any Two Questions) (2 x 10 = 20)** |  | |
| 10. | **Write** the steps of IT assessments or audits | **Ap** | **CO2** |
| 11. | **Write** the steps of Cross-site scripting (XSS). | **Ap** | **CO4** |
| 12. | **Describe** SQL injection and Cross-Site Request Forgery (CSRF) in details. | **U** | **CO3** |

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| **ECS62301** | Techical Report Writing &Seminar -I | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact hour-90** | **0** | **0** | **6** | **4** |
| **Pre-requisites/Exposure** | **Knowledge on Computer domain** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To **develop** skills in doing literature survey, technical presentation and report preparation.
* To **enable** project identification and execution of preliminary works on final semester project

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Identify** the advanced technologies and globalization

CO2. **Develop** communication and representation skills towards becoming a good team leader and

manager

CO3. **Plan** for lifelong learning towards industry readiness

CO4. **Build** the ability to identify an engineering problem, analyze it and propose a work plan to

solve it.

**Catalog Description:**

The course involves presentation and report submission by every student. Reference search and technical writing skills along with effective presentation skills are focused. The course strengthens the research attributes including literature survey.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Identify** the advanced technologies and globalization | **PO1, PO2, PO3** |
| **CO2** | **Develop** communication and representation skills towards becoming a good team leader and manager | **PO9, PO10** |
| **CO3** | **Plan** for lifelong learning towards industry readiness | **PO1, PO12** |
| **CO4** | **Build** the ability to identify an engineering problem, analyze it and propose a work plan to solve it. | **PO1, PO2, PO3, PO4, PO5, PO6** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS62301 | Technical Report Writing &Seminar -I | 3 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | - | 1 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

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| --- | --- | --- | --- | --- | --- |
| **ECS62401** | Thesis (Part – I) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours-240** | **0** | **0** | **24** | **16** |
| **Pre-requisites/Exposure** | **Basic idea of the required subjects** | | | | |
| **Co-requisites** |  | | | | |

**Course Objectives:**

* To be able to design, develop, document, and test software using current techniques.
* To understand the fundamentals of computer architecture and computing theory.
* To be able to solve problems working in group settings.
* To demonstrate the ability to give presentations and write technical reports.
* To demonstrate understanding of the importance of social and ethical issues related to the profession.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1**. Identify** a real world problem

CO2. **Utilize** the modern tools to solve the problems

CO3. **Discuss** in a group to promote team spirit and leadership quality among the students

CO4. **Plan** a projects involving both technological aspects and finance

CO5. **Identify** newer areas of in depth study and research and lifelong learning

**Catalog Description:**

The course encourages students to take thesis works that are based on current trends and technologies in various subjects, which will augment the theory subjects. The students will form a group to do their thesis work. This teaming is to encourage team spirit and to insist the importance of team work. The students typically undergo group formation, finalization of area of work, testing, generation and verification of results, and possible research publication procedure.

**Course Content:**

The Evaluation of the thesis work are to be carried out in the following way:

1. In-depth study of a topic proposed by the supervisor

2. Continuous Evaluation through guide.

3. An open pre-submission seminar by the student.

4. End-semester University Examination (An open seminar followed by a Viva voce)

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **-** | **-** | **-** | **100** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Investigate** a real world problem | **PO2, PO3** |
| **CO2** | **Utilize** the modern tools to solve the problems | **PO2, PO3** |
| **CO3** | **Discuss** in a group to promote team spirit and leadership quality among the students | **PO1, PO9, PO11** |
| **CO4** | **Plan** a projects involving both technological aspects and finance | **PO3, PO7, PO9, PO10, PO11** |
| **CO5** | **Identify** newer areas of in depth study and research and lifelong learning | **PO7, PO9, PO11, PO12** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual and team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  62401 | Thesis (Part – I) | 1 | 2 | 3 | - | - | - | 2 | - | 1 | 1 | 3 | 1 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ECS62302** | Technical Report Writing & Seminar –II | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hour - 60** | **0** | **0** | **6** | **4** |
| **Pre-requisites/Exposure** | **Knowledge on Computer Domain** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To **develop** skills in doing literature survey, technical presentation and report preparation.
* To **enable** project identification and execution of preliminary works on final semester project

**Course Outcomes:**

On completion of this course, the students will be able to

CO1. **Identify** the advanced technologies and globalization

CO2. **Develop** communication and representation skills towards becoming a good team leader and

manager

CO3. **Plan** for lifelong learning towards industry readiness

CO4. **Build** the ability to identify an engineering problem, analyze it and propose a work plan to

solve it.

**Catalog Description:**

The course involves presentation and report submission by every student. Reference search and technical writing skills along with effective presentation skills are focused. The course strengthens the research attributes including literature survey.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Identify** the advanced technologies and globalization | **PO1, PO2, PO3** |
| **CO2** | **Develop** communication and representation skills towards becoming a good team leader and manager | **PO9, PO10** |
| **CO3** | **Plan** for lifelong learning towards industry readiness | **PO1, PO12** |
| **CO4** | **Build** the ability to identify an engineering problem, analyze it and propose a work plan to solve it. | **PO1, PO2, PO3, PO4, PO5, PO6** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS62302 | Technical Report Writing &Seminar -II | 3 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | - | 1 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ECS62402** | Thesis (Part – II) | **L** | **T** | **P** | **C** |
| **Version 1.0** | **Contact Hours -270** | **0** | **0** | **27** | **18** |
| **Pre-requisites/Exposure** | **Basic idea of the required subjects** | | | | |
| **Co-requisites** |  | | | | |

**Course Objectives:**

1. To be able to design, develop, document, and test software using current techniques.

2. To understand the fundamentals of computer architecture and computing theory.

3. To be able to solve problems working in group settings.

4. To demonstrate the ability to give presentations and write technical reports.

5. To demonstrate understanding of the importance of social and ethical issues related to the profession.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1**. Identify** a real world problem

CO2. **Utilize** the modern tools to solve the problems

CO3. **Discuss** in a group to promote team spirit and leadership quality among the students

CO4. **Plan** a projects involving both technological aspects and finance

CO5. **Identify** newer areas of in depth study and research and lifelong learning

**Catalog Description:**

The course encourages students to take thesis works that are based on current trends and technologies in various subjects, which will augment the theory subjects. The students will form a group to do their thesis work. This teaming is to encourage team spirit and to insist the importance of team work. The students typically undergo group formation, finalization of area of work, testing, generation and verification of results, and possible research publication procedure.

**Course Content:**

The Evaluation of the thesis work are to be carried out in the following way:

1. In-depth study of a topic proposed by the supervisor

2. Continuous Evaluation through guide.

3. An open pre-submission seminar by the student.

4. End-semester University Examination (An open seminar followed by a Viva voce)

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **-** | **-** | **-** | **100** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Investigate** a real world problem | **PO2,PO3** |
| **CO2** | **Utilize** the modern tools to solve the problems | **PO2,PO3, PO11** |
| **CO3** | **Discuss** in a group to promote team spirit and leadership quality among the students | **PO1, PO9** |
| **CO4** | **Plan** a projects involving both technological aspects and finance | **PO3,PO7, PO9,PO10, PO11** |
| **CO5** | **Identify** newer areas of in depth study and research and lifelong learning | **PO7, PO9, PO11,PO12** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual and team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  62402 | Thesis (Part – II) | 1 | 2 | 3 | - | - | - | 2 | - | 3 | 1 | 3 | 1 |

1=weakly mapped 2= moderately mapped 3=strongly mapped

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ECS62502** | Comprehensive Viva | **L** | **T** | **P** | **C** |
| **Version 1.0** |  | **0** | **0** | **0** | **4** |
| **Pre-requisites/Exposure** | **Willing to knowledge acquisition** | | | | |
| **Co-requisites** | **--** | | | | |

**Course Objectives:**

* To Give an overview of emerging technology and relate to subject.
* To enable students to improve their reasoning ability.
* To give the students a outline of technical question.
* To expound Idea dissemination for a new technology by assessment of pupil’s knowledge.

**Course Outcomes:**

On completion of this course, the students will be able to

CO1**. Understand** importance of knowledge acquisition.

CO2**. Conceptualize** the real-life scenario, based on viva question.

CO3. **Formalize** and practical implementation with emerging application.

CO4**. Expound** understanding in technology up gradation.

**Catalog Description:**

The course tests the technical knowledge acquired during the study, spoken skills, and the ability to think logically under time pressure. The course proves extremely useful for placement interviews

**Course Content:**

Scientific approach to resolve open end question, Theoretical Vs Practical exploration, in research paradigms, epistemology and ontology in management research, positivism vs. interpretivism, subjectivism vs. objectivism.

Foundations of confidence building in answering question, Categories of theory, theory building vs. theory testing, conceptualization and hypothesis testing. Analyze the conformity of the system to the functional requirements Appreciate importance of fundamental knowledge and its application.

**Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination**

**Examination Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **Attendance** | **Internal Assessment** | **MTE** | **ETE** |
| **Weightage (%)** | **10** | **30** | **20** | **40** |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

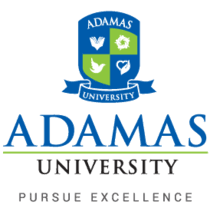
|  |  |  |
| --- | --- | --- |
| **Mapping between COs and POs** | | |
|  | **Course Outcomes (COs)** | **Mapped Program Outcomes** |
| **CO1** | **Understand** importance of knowledge acquisition. | **PO4,PO10,** |
| **CO2** | **Conceptualize** the real-life scenario, based on viva question | **PO10 PO3,PO5,PO6, PO8,PO9,PO2,** |
| **CO3** | **Formalize** and practical implementation with emerging application. | **PO1, PO12, PO2, PO3,PO5,PO6** |
| **CO4** | **Expound** understanding in technology up gradation. | **PO2, PO3,PO5,PO6,PO7,P09,PO11** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| ECS  62502 | Comprehensive Viva | 2 | 3 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 3 | 1 | 1 |

1=weakly mapped

2= moderately mapped

3=strongly mapped

****

**ADAMAS UNIVERSITY**

**SCHOOL OF ENGINEERING & TECHNOLOGY**

**DEPARTMENT OF COMPUTER SCIENCE ENGINEERING**

**CO – PO & PSO MAPPING**

**Name of the Programme: M. Tech in Computer Science and Engineering**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| ECS61101 | Foundation of Computing Science | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| ECS61103 | Advanced Algorithms | 3 | 3 | 2 | 1 | 2 | 1 | - | - | - | - | - | **-** |
| ECS61105 | Pattern Recognition (Elective- II) | 3 | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - |
| ECS61107 | Artificial Intelligence (Elective -II) | 1 | 1 | 1 | 2 | - | 1 | 1 | - | - | - | - | 3 |
| ECS61109 | Logic Programming(Elective -II) | 2 | 2 | 1 | 2 | - | 1 | 1 | - | - | - | - | 3 |
| ECS61111 | Soft Computing(Elective – II) | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 1 |
| ECS61113 | Image and Video Processing(Elective -III) | 3 | 3 | 1 | 3 | - | 1 | - | - | - | - | - | **-** |
| ECS61115 | Advanced Graph Theory(Elective -III) | 3 | 3 | 2 | - | - | 2 | 1 | - | - | - | - | 3 |
| EEC61127 | VLSI design(Elective -III) | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 |
| EEC61129 | Mobile computing(Elective -III) | 3 | 3 | 3 | 1 | 3 | 1 | - | - | - | - | - | - |
| ECS61301 | Seminar -I | 3 | 2 | 2 | 1 | 1 | 1 | 1 | - | 1 | 1 | - | 1 |
| ECS61201 | Computing Lab –I | 2 | 2 | 2 | 1 | 1 | 1 | - | - | - | - | - | - |
| ECS61102 | Parallel & Distributed Computing | 3 | 2 | 1 | 2 | 2 | 1 | - | - | - | - | - | 1 |
| ECS61104 | Advance Database System(Elective -IV) | 3 | 3 | - | 1 | 1 | - | - | - | - | - | - | - |
| **Course Code** | **Course Title** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| ECS61106 | Cloud computing(Elective -IV) | 3 | 3 | 2 | 1 | 2 | 1 | 1 | - | - | - | - | 2 |
| ECS61108 | Neural Network and Deep Learning(Elective -IV) | 3 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 |
| ECS61110 | Advanced Compiler Design(Elective -IV) | 3 | 3 | - | - | 3 | 3 | - | - | - | - | - | 3 |
| ECS61112 | Machine Learning(Elective -V) | 3 | 2 | 1 | 2 | 1 | - | - | - | - | - | - | - |
| ECS61114 | Information Retrieval (Elective-v) | 1 | 1 | 1 | 2 | 1 | 1 | 1 | - | - | - | - | 1 |
| ECS61116 | Computational complexity(Elective -IV) | 3 | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - |
| ECS61118 | Formal System(Elective -VI) | 1 | 2 | 3 | 2 | 2 | 2 | - | - | 1 | - | 1 | 1 |
| ECS61120 | Principle of Programming(Elective -VI)Language (Elective VI) | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - |
| ECS61122 | High Performance Computer Architecture(Elective -VI) | 3 | 2 | 3 | - | 3 | 2 | - | - | - | - | - | 3 |
| ECS61124 | Natural Language Processing(Elective -VII) | 3 | 3 | 3 | 3 | 2 | 1 | - | - | - | ----- | - | - |
| ECS61128 | Internet of Things(Elective -VII) | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 3 | 2 | 3 |
| MBA61142 | E-Commerce (Elective -VII) | 2 | 2 | 3 | 1 | - | 2 | - | - | 2 | - | 2 | 1 |
| ECS61302 | Seminar -II | 3 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | - | 1 |
| ECS61202 | Computing Lab –II | 3 | 3 | 3 | 1 | 1 | 2 | - | - | - | - | - | - |
| ECS62101 | Cryptography and cryptosystem | 3 | 3 | 1 | - | 2 | - | 1 | - | - | - | - | - |
| ECS62103 | Information security | 3 | 3 | 1 | - | 2 | - | - | - | - | - | - | - |
| ECS62105 | Cyber security | 2 | 2 | 1 | - | 1 | - | 1 | - | - | - | - | - |
| ECS62301 | Technical report writing and Seminar -I | 3 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | - | 1 |
| ECS62401 | Thesis(Part – I) | 1 | 2 | 3 | - | - | - | 2 | - | 3 | 1 | 3 | 1 |
| **Course Code** | **Course Title** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| ECS62302 | Technical report writing Seminar -II | 3 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | - | 1 |
| ECS62402 | Thesis(Part –II) | 1 | 2 | 3 | - | - | - | 2 | - | 3 | 1 | 3 | 1 |
| ECS62502 | Comprehensive Viva | 2 | 3 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 3 | 1 | 1 |
| **Average of CO-PO Mapping** | | **2.64** | **2.17** | **2.11** | **1.71** | **1.69** | **1.50** | **1.75** | **1.50** | **1.60** | **1.50** | **2.00** | **1.71** |