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| Faculty of Engineering and Technology | | | |
| Ramaiah University of Applied Sciences | | | |
| Department | Computer Science and Engineering | Programme | B. Tech. |
| Semester/Batch | 04/2016 | | |
| Course Code | CSC209A | Course Title | Design and Analysis of Algorithms |
| Course Leader | Vaishali R. Kulkarni | | |

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| Sections | Marking Scheme | | Marks | | |
| Max Marks | First Examiner Marks | Moderator |
| Part A |  | | | | |
| **A.1.1** | **Introduction to heuristic approach** | **02** |  |  |
| **A.1.2** | **Comparison of heuristic and conventional algorithms** | **04** |  |  |
| **A.1.3** | **Stance and Justification** | **03** |  |  |
| **A.1.4** | **Conclusion** | **01** |  |  |
|  | **Part-A Max Marks** | **10** |  |  |
| Part B.1 |  | | | | |
| **B.1.1** | **Illustration of Graphs with adjacency matrix and lists** | **02** |  |  |
| **B.1.2** | **Brute-force algorithm for this task** | **04** |  |  |
| **B.1.3** | **C Program** | **04** |  |  |
|  | **B.1 Max Marks** | **10** |  |  |
| Part B.2 |  | | | | |
| **B.2.1** | **Design of an algorithm for solving this puzzle** | **02** |  |  |
| **B.2.2** | **Illustration of moves** | **03** |  |  |
| **B.2.3** | **C Program** | **05** |  |  |
|  | **B.2 Max Marks** | **10** |  |  |
| Part B.3 |  | | | | |
| **B.3.1** | **Calculation of time and space complexity of the algorithm** | **02** |  |  |
| **B.3.2** | **Different algorithms to improve solutions of this problem** | **03** |  |  |
| **B.3.3** | **Use of hashing techniques to solve this problem** | **02** |  |  |
| **B.3.4** | **C Program** | **03** |  |  |
|  | **B.3 Max Marks** | 10 |  |  |
| Part B.4 |  | | | | |
| **B.4.1** | **Identification of data structures** | **02** |  |  |
| **B.4.2** | **Algorithm and C program** | **06** |  |  |
| **B.4.3** | **Justification of branch and bound method** | **02** |  |  |
|  | **B.4 Max Marks** | **10** |  |  |
| **Total Assignment Marks** | | | 50 |  |  |

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| Assignment-02 | | | |
| Reg.No. |  | Name of Student |  |

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| **Course Marks Tabulation** | | | | |
| **Component-1 (B) Assignment** | **First Examiner** | **Remarks** | **Moderator** | **Remarks** |
| A |  |  |  |  |
| B.1 |  |  |  |  |
| B.2 |  |  |  |  |
| B.3 |  |  |  |  |
| B.4 |  |  |  |  |
| **Marks (Max 50 )** |  |  |  |  |
| **Marks (out of 25 )** |  |  |  |  |
| **Signature of First Examiner Signature of Moderator** | | | | |

**Please note:**

1. Documental evidence for all the components/parts of the assessment such as the reports, photographs, laboratory exam / tool tests are required to be attached to the assignment report in a proper order.
2. The First Examiner is required to mark the comments in RED ink and the Second Examiner’s comments should be in GREEN ink.
3. The marks for all the questions of the assignment have to be written only in the **Component – CET B: Assignment** table.
4. If the variation between the marks awarded by the first examiner and the second examiner lies within +/- 3 marks, then the marks allotted by the first examiner is considered to be final. If the variation is more than +/- 3 marks then both the examiners should resolve the issue in consultation with the Chairman BoE.

**Assignment 2**

**Term - 2**

**Instructions to students:**

1. The assignment consists of **5** questions: Part A-**1** Question, Part B-**4** Questions.
2. Maximum marks is **50**.
3. The assignment has to be neatly word processed as per the prescribed format.
4. The maximum number of pages should be restricted to **20**.
5. Restrict your report for Part-A to 3 pages only.
6. Restrict your report for Part-B to a maximum of 17 pages.
7. The printed assignment must be submitted to the course leader.
8. **Submission Date: 23rd April 2018**
9. **Submission after the due date is not permitted.**
10. **IMPORTANT**: It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.
11. Marks will be awarded only to the sections and subsections clearly indicated as per the problem statement/exercise/question

**Preamble**

The Design and Analysis of Algorithms course is aimed at preparing the students to understand and apply the principles of data structures and algorithms. A broad range of abstract data types as well as algorithms for data storage, access and manipulation used in program development are discussed. The students implement standard data structures and develop algorithms for efficient computer programs. This assignment is designed to test the ability of the student to select appropriate data structures, develop applications using them, analyze them and generate an analytical report.

**Part A (10 marks)**

Algorithms can be heuristic or deterministic. The analysis of algorithms, in computer science is the determination of the time taken, storage and/or other resources necessary to execute them. Usually, this involves determining a function that relates the length of an algorithm's input to the number of steps it takes (its time complexity) or the number of storage locations it uses (its space complexity). An algorithm is said to be efficient when this function's values are small.

Debate on **“Heuristic algorithms perform better than deterministic algorithms in all optimization tasks”.** The debate should emphasize on:

A.1.1 Introduction to heuristic approach

A.1.2 Comparison of heuristic and conventional algorithms

A.1.3 Stance and Justification

A.1.4 Conclusion

**Part B (40 Marks)**

1. **(10 Marks)**

A network topology specifies the connections of computers, printers, and other devices over a network. The figure below illustrates three common topologies of networks: the ring, the star, and the fully connected mesh.



The given a Boolean matrix, where , is the adjacency matrix of a graph modelling a network with one of these topologies. Identify the topology represented by the matrix .The report should include the following:

**B.1.1** Illustration of Graphs with adjacency matrix and lists

**B.1.2** Brute-force algorithm

**B.1.3** C Program

**B.2 (10 Marks)**

A row of disks of two colours, dark and light, alternate in the given sequence: dark, light, dark, light, and so on. Arrange all the dark disks to the right-hand end, and all the light disks to the left-hand end. The only moves allowed are to interchange the positions of two neighbouring disks.



The report should include the following:

**B.2.1** Design of an algorithm to solve the puzzle

**B.2.2** Illustration of moves

**B.2.3** C Program

**B.3** **(10 Marks)**

Given an array of numbers, develop an algorithm for counting duplicate elements in the array and their positions. The report should include the following:

**B.3.1** Calculation of time and space complexity of the algorithm

**B.3.2** Different algorithms to improve solutions

**B.3.3** Hashing techniques to solve the problem

**B.3.4** C program

**B.4** **(10 Marks)**

There are workers and jobs. Any worker can be assigned to perform any job, incurring some cost that may vary depending on the work-job assignment. It is required to perform all jobs by assigning exactly one worker to each job and exactly one job to each worker in such a way that the total cost of the assignment is minimized. Use branch and bound concept. The report should include the following:

**B.4.1** Identification of the data structures

**B.4.2** Algorithm and C program

**B.4.3** Justification of branch and bound method