| Faculty of Engineering and Technology | | | |
|---|---|---|---|
| **Ramaiah University of Applied Sciences** | | | |
| Department | Computer Science and Engineering | Programme | B. Tech. in CSE |
| Semester/Batch | 06/2018 | | |
| Course Code | 19CSC311A | Course Title | Graph Theory and Optimization |
| Course Leader | Ms. Pallavi R. Kumar and Mr. Narasimha Murthy K. R. | | |

| Assignment-1 | | | |
|---|---|---|---|
| **Reg. No.** | | **Name of Student** | |

| Sections | | Marking Scheme | Max Marks | First Examiner Marks | Moderator |
|---|---|---|---|---|---|
| **Part A** | A.1.1 | **Answers and Justification** | 06 | | |
| | A.1.2 | **Algorithm** | 04 | | |
| | A.1.3 | **Code and results** | 06 | | |
| | | **Part-A Max Marks** | 16 | | |
| **Part B** | B.1.1 | **Detailed Explanation of Approach** | 04 | | |
| | B.1.2 | **Algorithm** | 05 | | |
| | | **Part-B Max Marks** | 09 | | |
| | | **Total Assignment Marks** | 25 | | |

| Course Marks Tabulation | | | | |
|---|---|---|---|---|
| **Component-1 (B) Assignment** | **First Examiner** | **Remarks** | **Moderator** | **Remarks** |
| **A** | | | | |
| **B** | | | | |
| **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 1

## Term - 1

**Instructions to students:**

1. The assignment consists of **2** questions: Part A-**1** Question, Part B-**1** Question.

2. Maximum marks is **25**.

3. The assignment has to be neatly word processed as per the prescribed format.

4. The maximum number of pages should be restricted to **10**.

5. The printed assignment must be submitted to the course leader.

6. **Submission Date: 2nd June 2021**

7. **Submission after the due date is not permitted.**

8. **IMPORTANT**: It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.

9. Marks will be awarded only to the sections and subsections clearly indicated as per the problem statement/exercise/question

This course intends to teach the concepts, techniques and applications of graph theory and discrete optimization. Basic graph theory and applications of optimization theory for efficient solution of graph problems arising in Computer Science and Engineering as well as Discrete Optimization techniques for Integer Linear Programming and Combinatorial Optimization and their applications are dealt in detail. Local Search and Metaheuristic approaches to combinatorial optimization problems are taught. Random Graphs and Spectral Theory of Graphs are covered. Students are trained to apply discrete optimization and graph theory to design and analyze solutions for problems in Computer Science and Engineering.

**Part A**                                                                                                   **(16 Marks)**

In the early eighteenth century the city of Königsberg was in Prussia. The city neatly straddled the River Pregel in which two large islands were connected to each other, and to the two banks of the river, by seven bridges. The middle classes of the period created a problem for themselves. They wanted to start at some point of the city and walk over each bridge once and only once. But there was an extra condition. They also wanted to end up at the point where they had started.
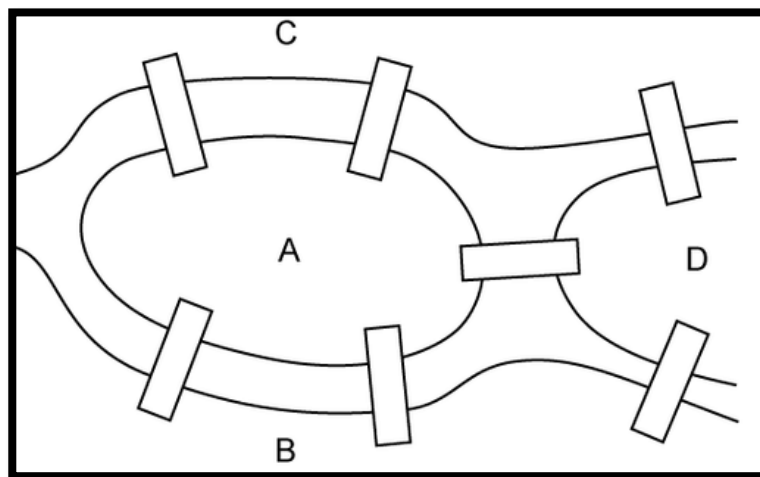


Your document should include the following:

> **A.1.1** Answer the following questions with justification.
> > a. Can the people of Königsberg successfully walk over all the bridges once and get back to where they started?
> > b. Can the bridge walk be achieved if the people were happy not returning to their starting point?
> > c. If one or more of the bridges were removed, can the round trip walk around the bridges of Königsberg be achieved?
> > d. If the city of Königsberg had seven bridges arranged in some other way, will it be possible to make the round trip walk successfully?
> > e. If the seven bridges of Königsberg are replaced with eight, nine and ten bridges,

what can be commented about the land masses in each of the cases?

f. To cover n number of bridges is there a generalized result? Is there any relevance of knowing in what way the bridges are connected to the land masses?

**A.1.2** In a language of your choice, for p number of land masses and q number of bridges develop a program to print the possible path through every land mass using every bridge (if possible), travelling through every bridge only once.

Document the following:
   a. Algorithm
   b. Code and screenshots

**Part B**                                                          **(6 Marks)**
Sudoku is a single player logic based puzzle. A Sudoku puzzle is a grid of 81 cells, which is divided into 9 rows, columns and regions (or blocks). The goal is to place the numbers from 1-9 into empty cells in such a way, that in every row, every column and every region (3 x 3 block) each number appears only once. You are required to devise an approach on how Sudoku can be solved using Graph Coloring.

Include the following in your report:
    **B.1.1** Detailed explanation of approach
    **B.1.2** Algorithm

<p align="center">*******</p>