LIBRA
01 JAN 20
Eastern University, Sri

EASTERN UNIVERSITY, SRI LANKA

SECOND EXAMINATIN IN SCIENCE 2002/2003 (Repeat)

FIRST SEMESTER (June/July, 2003)

CS201 Data Structures and Design of Algorithms

Answer all questions

Time allowed: 2 Hours

Q1

Describe briefly what an array data structure is and how it would be used to store and retrieve data.

A tri-diagonal matrix is a square matrix $\mathbf{A} = (\mathbf{a}_{ij})$ in which $\mathbf{a}_{ij} = 0$ if $| i - j | > 1$.

Describe briefly how such matrices can be represented by means of sequential allocation.

Write down the number of non-trivial elements in an M x M tri-diagonal matrix.

Represent a tri-diagonal matrix as a one-dimensional array in row-major fashion, and find its row sums and diagonal sums using this representation.

Q2

Define and implement ***ADT Queue*** data structure.

Define ***ADT Stack*** data structure and implement it using two queues.

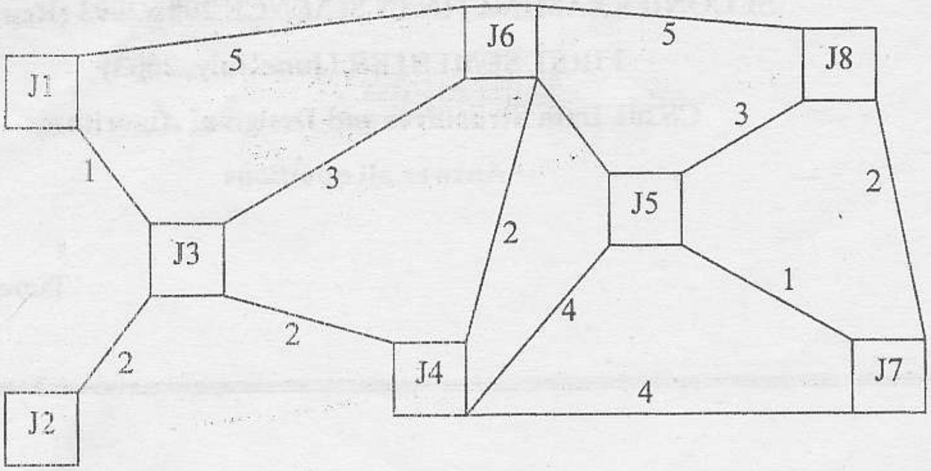
Write a main program that reads a sequence of 20 integers, pushing all of the even integers on a queue and the odd integers on a stack. Print the contents of each stack.

Q3

The CEB plans to put powerful bulbs at each junction of the Vantharumoolai village. CEB wishes to install a separate cable system to supply electricity for this purpose with minimum cable length. The programmer of the CEB is requested to compute the minimum length required, providing the map of the village which is shown the graph below:

This question continues....

Continuation...



In the above graph, nodes J1, J2. J3, J4, J5, J6, J7, J8 represent junctions and the numbers on the edges are the distances between junctions.

If you are the programmer, describe briefly how you would solve such a problem, and fi the minimum cable length for this particular problem stated above.

If there is a new junction J9 situated at a distance of X from J2, state clearly how the val of X would alter your answer.

Q4

(a) Describe the ***Bubblesort*** algorithm to sort any given list of numbers.

Give a complexity analysis of the ***Bubblesort*** algorithm.

(b) Describe briefly ***Divide-and-Conquer*** technique with a suitable example.

Describe the **Merge*sort*** algorithm to sort given list of numbers.

Give a complexity analysis of the ***Mergesort*** algorithm.

Trace the above sorting algorithms for each of the following lists of numbers:

(a) 5, 5, 5, 5, 5, 5

(b) 5, 6, 7, 8, 9, 12

(c) 15, 13, 12, 10, 5

(d) 4, 7, 2, 8, 5, 9