KIBABII UNIVERSITY COLLEGE
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UNIVERSITY EXAMINATIONS
2013/2014 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE OF

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

CODE: CSC 224

TITLE: DATA STRUCTURES

DATE: 23 / 04 / 2014 **TIME**: 2:00P.M. – 5:00P.M.

INSTRUCTIONS

- Answer questions one and any other two questions only.
- Question one carries 30 marks and the other questions carry 20 marks each

QUESTION #1 [30 marks]

a) What are the major data structures used in the following areas: RDBMS, Network data model & Hierarchical data model? [3 marks]

b) State the minimum number of queues needed to implement the priority queue? [2 marks]

c) Distinguish between Stack and Linked structure? [3 marks]

d) Explain the following: [6 marks]

i: An array
ii: Heap
iii: Stack
iv: Linked List
v: Enqueue
vi: Pop( )

e) Data abstraction vs Data encapsulation [2 marks]

f) There are 8, 15, 13, 14 were there in four different trees. Which of them could have formed a full binary tree? Explain your answer . [3 marks]

g) Draw a Binary tree for the expression **:** A * B - (C + D) * (P / Q) [5 marks]

h) (i) Explain a Data structure? [2 marks]

(ii) Explain any FOUR advantages of ADTs. [4 marks]

SECTION II: ANSWER ANY TWO QUESTIONS

QUESTION #2[20 Marks]

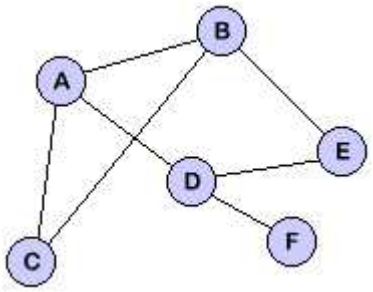
a) The diagram below shows an array structure called **Scores** of ten(***int***) high scores for a video game

i: Write a program construct that use a function called Sum that will be able to sum the elements of the array. **[4 marks]**

ii: Write a function that will be able search through the array element for a value keyed in from the main class **[4 marks]**

b) Convert the expression ((A + B) * C – (D – E) ^ (F + G)) to equivalent Prefix and Postfix notations. **[4 marks]**

c) Draw an adjacency matrix for the graph shown below. **[4 marks]**

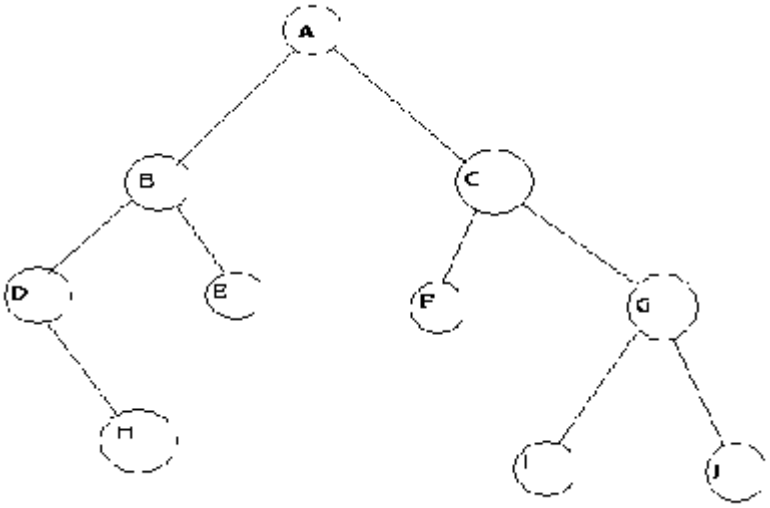


d) State four areas of application of data structures. **[4 marks]**

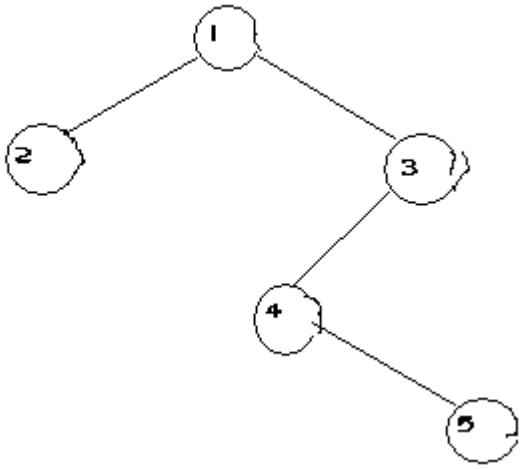
QUESTION #3[20 Marks]

a) What is the data structures used to perform recursion? [2 marks]

b) A binary tree with 20 nodes has_____ null branches? [2 marks]
c) List three few of the application of tree data-structure? [3 marks]
d) Traverse the given tree using Inorder, Preorder and Postorder traversals [6 marks]



e) In the given binary tree, using array you can store the node 4 at which location? Give an explanation for your Answer. [3 marks]



f) State whether a Linked list is a Linear or Non linear data Structure? [2 marks]

QUESTION #4[20 Marks]

a) Draw a diagram representing a LIFO structure for the program statement
X=4+8*4/3 [3 marks]

b) Write a C++ program to implement a FIFO stack which allocates space dynamically. The size of the stack should increase dynamically with each push operation and decrease (via *delete*) with each pop operation. Support an operation to print the data presently on the stack. [8 marks]

c) Give a generic formula for finding the memory location of an array element, given the base address and an array element size. [3 marks]

d) Describe how a stack and queue can be stored in an array [6 marks]

QUESTION #5[20 Marks]

a) Explain the following terms: [6 marks]
   i. Ordered List
   ii) Homogenous ordered List
   iii: Heterogeneous ordered list

b) Draw a picture of a {linked list, circular linked list, and doubly linked list} with nodes containing the integer values 35, 27, 13, 41. Do not use any dummy nodes.[6 marks]

c) Describe how a {stack, queue} can be represented using a linked list? What is the main advantage of this representation over arrays? [5 marks]

d) Define a {min,max} heap [3 marks]