JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELORS IN BUSINESS INFORMATION SYSTEMS

2ND YEAR 1ST SEMESTER 2016/2017 ACADEMIC YEAR

MAIN CAMPUS

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COURSE CODE: IIS 3216

COURSE TITLE: DATA STRUCTURES AND ALGORITHMS

EXAM VENUE: STREAM: BIS/ICT

DATE: APRIL 2017   EXAM SESSION:

TIME: 2 HOURS

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INSTRUCTIONS:

a) Answer Question 1 (Compulsory) and ANY other two questions
b) Candidates are advised not to write on the question paper
c) Candidates must hand in their answer booklets to the invigilator while in the examination room

QUESTION 1(30 MARKS)

a) Identify and briefly explain at least four data structures that are commonly used
(4 marks)

b) For each of the following structures, write an algorithm for capturing the data elements:

  i.   a queue,
  ii. a stack,
  iii. a list
(6 marks)

c) Explain why a test for an empty stack must be carried out when performing stack operations. Write a procedure/ function for the function EMPTY of a stack identifier
(4 marks)

d) If you push the letters A, B, C and D in order onto a stack of characters and then POP. In what order will they be deleted from the stack?
(2 marks)

ii) Represent the following expression as binary tree and write prefix and postfix form of the expression

(A+B+C*D)-(A/B-CD+E)
(4 marks)

f) I) Define a Linked list and explain why it is preferred than array structure
(4 marks)

g) State and define all the possible operations on a stack data structure
(6 marks)

QUESTION 2(20 MARKS)

a) Describe how insertion of a node in between the linked list can be carried out illustrated your answer with a diagram
(5 marks)

b) Write an algorithm for the Fibonacci function
(4 marks)

c) Write an algorithm for the binary search algorithm
(6 marks)

d) Explain the concept of the graph and where it can be applied
(5 marks)

QUESTION 3(20 MARKS)

a) Convert the following infix arithmetic expression into its equivalent reverse polish form

A+B*C
(A+B)*C
A/CB-(C+D)*(E-A)*C
A/B-C+D*E+A+C
(8 marks)

b) Use stack to evaluate the postfix expression ABC+D*+E+. Show the status of the stack after each step of the algorithm. Assume the following values for the identifiers: A=8, B=5, C=3, D=9, E=4.
(12 marks)

QUESTION 4 (20 MARKS)
 a)
  i) Construct a binary search tree using the following data
    50 70 25 90 30 55 25 15 25
                                                    (8 marks)
Using the above information trace the algorithm for deleting node 30
                                                    (12 marks)

QUESTION FIVE [20 Marks]
a) Discuss the areas where you would apply the following data structures
       i.   Linked list
       ii.   Queue
       iii. Stack
       iv.   List
                                                    (8 marks)
b) What is linear search? Write the algorithm for the linear search
                                                    (12 marks)