UNIVERSITY OF ILORIN, ILORIN
FACULTY OF COMMUNICATION AND INFORMATION SCIENCES
DEPARTMENT OF COMPUTER SCIENCE
2018/2019 B.Sc. DEGREE RAIN SEMESTER EXAMINATION IN COMPUTER SCIENCE

COURSE TITLE: COMPILER CONSTRUCTION NO.OF CREDIT: 3
COURSE CODE: CSC 454 LEVEL: 400 TIME: 3HRS
INSTRUCTION: ANSWER ANY FOUR (4) QUESTIONS.

Question 1

Consider the context-free grammar:

E → num
E →E un_op
E →E E bin_op
un_op → ~|\
bin_op → +| -| * | /

(a) Give a rightmost derivation for the string 3 ~ 4 2 + *
(b) Give a parse tree for this same string
(c) Is the grammar LL(1)?. Justify your answer.
(d) If your answer in (c) above is "NO", design an equivalent grammar that is LL(1) or explain why no such grammar can exist.

Question 2

Consider the following grammar for postfix expressions:

E → E E+
E → E E*
E →**num**

(a) Eliminate left-recursion in the grammar.
(b) Do left-factorization of the grammar produced in (a) above
(c) Construct a LL(1) parse-table for the grammar produced in (b)

Question 3

(a) Consider the grammar: {S → BA, A → Aa | a, B → Bb | b}.Use a shift-reduce parsing algorithm to parse the string bbbaa . Show clearly the stack content, sentential form, and action taken in each parsing step
(b) Consider the grammar: A → a A a
A → b A b
A → ε
(i) Describe the language that the grammar defines.
(ii) Is the grammar ambiguous? Justify your answer.

Question 4

Consider the following regular expression from the alphabet {a,b}

b*a | bb

(a) Use Thompson's construction to construct an NFA from the regular expression
(b) Use subset construction to create a DFA equivalent to the NFA you constructed in (a) above

Question 5

Given the following grammar:

module ::= statement
statement ::= PRINT expression_list
expression_list ::= expression | expression COMMA expression_list
expression ::= INT | MINUS expression | expression PLUS expression

(a) Draw the parse tree for the following program fragment
PRINT 2 PLUS 1 PLUS MINUS 3, 5

(b) Given the following grammar and the right sentential forms, draw a parse tree and show the phrases and simple phrases, as well as the handle for each of the sentential form
S→ AbB | bAc
A→Ab | aBB
B→Ac | cBb |c

(i) aaAbb
(ii) bBab
(iii) aaAbBb

Question 6

Consider the grammar described below:

1. <assign> → <id> = <expr>
2. <id>→ a | b | c
3. <expr>→<expr> + <term>
4. | <term>
5. <term> → <term> * <factor>
6. | <factor>
7. <factor> → (<expr>)
8. | **<id>**

(a) Use a shift-reduce parsing algorithm to parse the string a = (a + b) * c . Show clearly the stack content, sentential form, and action taken in each parsing step.

(b) Describe the language that the grammar defines.
(c) Is the grammar LL(1)? Justify your answer.
(d) Is the grammar ambiguous? Justify your answer.

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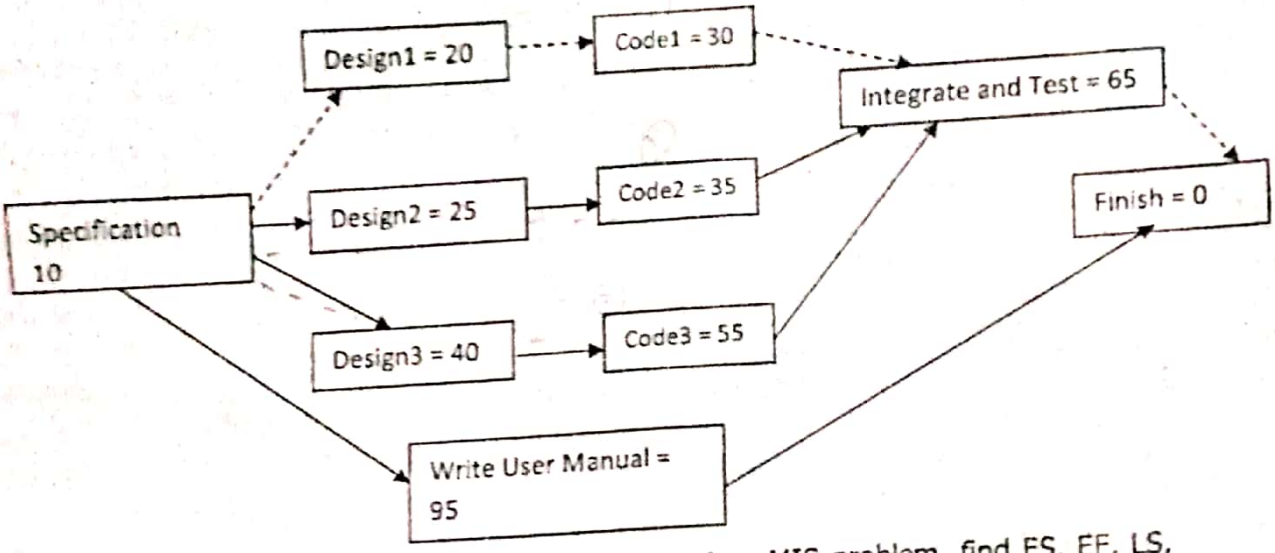
2018/2019 B.Sc. DEGREE RAIN SEMESTER EXAMINATION IN COMPUTER SCIENCE
COURSE CODE: CSC 420 COURSE UNIT: 3 LEVEL: 400 TIME: 2HRS
COURSE TITLE: SOFTWARE ENGINEERING

Section A: Answer Question one (1) and any other one



1. (a) Given the above activity representation of an MIS problem, find ES, EF, LS, LF, and ST for the activities. Present your results using appropriate table

(b) Represent the activities in a Gantt Chart

(c) You have been hired by the Civil Aviation Authority to develop a requirements specification and airworthiness certification programme for airlines. Describe how you would organize and run this project using software project management plan (SPMP) document.

(15mks)

2. (a) You have been hired as the software engineer to develop a departmental web portal that will consist of all activities in the department like lectures, exams, orientation, professional societies, games etc. Explain the metric(s) that you can use to estimate the size of the portal.

(b) "Fitness of purpose" is not a entirely satisfactory definition for quality of software product. True/False. Justify your answer with appropriate factors.

(c) As a System Analyst saddled with responsibilities of removing ambiguity and inconsistency from a given project, list six (6) questions you should clearly understand to obtain good grasp of the problem.

(15mks)

3. (a) As an engineer that does not understand fully the technical nitty-gritty of a project and also with a broke client, which life cycle model would you use for your client? Explain why.

(b) Stating your final year project title as an example, list three (3) functional requirements and three (3) non-function requirements of your research work.

(c) List and explain three (3) commonly used terms you will used to test your software product.

(15mks)

SECTION B: ANSWER ANY TWO QUESTIONS

1. (a) What is Software Project? **2 Marks**

(b) Explain briefly the requisite for Software Project Management. **5 Marks**

(c) As a young graduate of a Computer Science employed by an IT company based in Lagos State to Manage Software Project. List your responsibilities as a project Manager who may never be directly involved in producing the end product but control and manages the activities involved in production of software products. **8 marks**

2. (a) (i) What is UML? **2 Marks**

(ii) State main difference between Activity Diagram and Flow Chart. **3 Marks.**

(b) List and explain the three (3) types of Modeling in UML **5 Marks**

(c) Draw a process model for the task of painting the walls in a room. Include the following task: Choose color, buy paint, clean the walls, stir the paint, and paint the wall. **5 Marks**

3. (a) What is Object Oriented Programming? **2 Marks**

(b) List and explain the different steps involved in object oriented analysis **5 Marks**

(c) Draw a state diagram for a graphical user interface that has a main menu, a file menu with a file open command, and quit commands at each menu. Assume that only one file can be open at a time. **8 Marks**

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2018/2019 B.Sc. DEGREE RAIN SEMESTER EXAMINATION IN COMPUTER SCIENCE

COURSE CODE: CSC 438 COURSE UNIT: 2 LEVEL: 400
COURSE TITLE: VISUAL PROGRAMMING TIME: 2 HRS
INSTRUCTIONS: ANSWER ALL QUESTIONS FROM SECTION A AND ANY TWO QUESTIONS FROM SECTION B

SECTION A: ANSWER ALL QUESTIONS FROM THIS SECTION

1. What connection object is used to access Microsoft Access database from Visual Basic .Net?
2. ---------- enables you to create object-oriented applications?
3. -------- window is used to change the characteristics of any control in Visual Basic?
4. Which menu is used to navigate between design and code windows?
5. A statement to generate a random number between 0 and 9 is ----------?
6. --------- is a method of ProgressBar control that can be used to activate it.
7. Collection of projects and files that make up an application or component is ----------?
8. ---------- is the default event of a command button?
9. SelectCommand is a property of ---------- object?
10. ---------- is a window that does not cause other windows to be disabled?
11. To create a completely opaque (solid) windows form, opacity value must be set to --------?
12. True/False: The Fill() method is provided by DataTable object?
13. ---------- property can be used to disable editing of text in a TextBox control?
14. Write a line of statement that inserts 'Python' as an item into a List box control.
15. Write a statement to remove an item at location 2 from a List box control.
16. ---------- is a unique property that distinguishes List box from Combo box control?
17. ---------- is the event that can be used to activate a Timer control?
18. What is the output of the following statement *Mid("This is my name", 6, 5)*?
19. What is the output of the following statement *InStr("This is my name", "name")*?
20. What is the output of *MessageBox.Show(Format(#1/22/2009#, "MMM"))*?
21. What function can be used to retrieve the interval between two existing dates or times?

Use the following code segment to answer questions 22, 23, 24, and 25.

```
Dim total As Integer = 0
Dim numbers() As Integer = {12, 10, 8, 32, 64, 19}
For J = 0 To 4
        If (numbers(J) > 10) Then
                total = total + numbers(J)
        Else
          numbers(J) = 0
        End If
Next J
```

22. What is the final value of the variable total?
23. What is the final value of the array numbers(2)?
24. What is the final value of the array numbers(3)?
25. What is the final value of the array numbers(5)?

(25 marks)

SECTION B: ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION 1

(a) Highlight four ways by which an event can be triggered in Visual Basic.
(b) Assuming a database table contains the following fields: MatricNo, LastName, FirstName, and MiddleName, write:
(i) Visual Basic code segment to populate the table with the data entered in a window's form that contains text box for each field.
(ii) Visual Basic code segment to edit the first record in the database table.
(c) Discuss in detail the functions of the following methods:
(i) WriteLine() (ii) Write() (iii) ReadToEnd() (iv) ReadLine()
(d) Write a Visual Basic code segment that reads the contents of a text file all at once and displays it in a TextBox control.

($17^{1/2}$ marks)

QUESTION 2

(a) What are the advantages and disadvantages of programming with Visual Basic?
(b) Write a Visual Basic program that allows a user to throw three dice and displays the sum of the numbers on the three dice in a label control.
(c) Develop a Visual Basic program that reads the contents of a text file one line at a time and add the content of each line to a list box control using Do … Loop construct.
(b) Develop a Visual Basic project to compute the value of Z given that $Z = x^2 + 2ab - d^3$

($17^{1/2}$ marks)

QUESTION 3

(a) Define the following terms (i) distributed component (ii) project (iii) solution
(b) What do you understand by form modality? Hence, discuss the basic steps for creating modal and non-modal windows forms.
(c) Create a form with two list boxes. Add a button that when clicked removes the selected item in the first list box and adds it to the second list box. Also, add a second button, which when clicked removes all the items in the first list box and adds them to the second list box all at once.
(d) State the most important properties of a ProgressBar control.

($17^{1/2}$ marks)

QUESTION 4

(a) Write a Visual Basic function to check if a source file exists or not. If the file exist, the function should return true, otherwise false.

(b) Write Visual Basic code segments that make use of the function in (a) above to achieve the following file operations:

(i) Copy a file from one location to another (ii) Move a file from one location to another

(iii) Delete a file from the specified location

(c) Write a function named DiceRoll that returns a random integer between 1 and 6.

(d) Write a temperature conversion program that converts a Fahrenheit temperature to a Celsius and Kelvin temperature. (**Hint:** Celsius = 5/9 x (Fahrenheit – 32); Kelvin = Celsius + 273)

($17^{1/2}$ marks)

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2018/2019 B.Sc. DEGREE RAIN SEMESTER EXAMINATION IN COMPUTER SCIENCE

COURSE CODE: CSC 450 No of Credit: 2 LEVEL: 400 TIME: 2 HOURS
COURSE TITLE: ORGANIZATION OF PROGRAMMING LANGUAGE
INSTRUCTION: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

1(a) What are the role and purpose of programming language in computing? (6 Marks)

(b) Use this program to answer question i-v

```
Program Question_HSC401 (Input, Output);
        var x: real;
        count: integer;
function Question1 (y:real): real;
            var w: real;
begin w:=y*y;
        Question1 := w
        end;
function Question2 (z:real): real;
      var v: real;
begin if z=0.0 then v:=0.0
        else v:= 1.0/z;
        Question2:= v
end;
        begin for count:=1 to 10 do
                begin readln(x);
writeln(x, Question1(x), Question2(x))
                end
                        end.
```

(i) How many blocks are in the program? Name them.
(ii) Write down the scope of variables x, count, w and v.
(iii) Is it permissible to refer to variable x in function Question1 and why?
(iv) Is it permissible to refer to variable w in function Question2 and why?
(v) Write down the statement in the program from which the functions were called. (17 Marks)

(c) What factors were the driving forces behind the development of HLL? (4 Marks)

(d) What is the function of scope resolution operator (::) as commonly used in C++? (3 Marks)

2(a) Why do you think there are many HLLs? (3 Marks)

(b) Briefly discuss the concepts of Keyword and Reserved Words as they affect Fortran PL. (4 Marks)

(c) Consider the following enumeration data definition in C++:

```
enum WeekDays{sun, mon, tue, wed, thur, frid, sat};
enum MyColor{red, yellow, green, blue};
```

(i) Write equivalent of the above definition in Pascal.
(ii) Aside Pascal and C/C++, mention 2 programming languages that support enumeration.
(iii) Declaring a variable x as type color with

```
enum WeekDays y;
```

With declaration and definition above, does "*y=fri;*" a valid initialization? Give reason (8 Marks)

3(a) State the purpose of data type declaration in programming language. (6 Marks)

(b) What are the advantages and disadvantages of interpretation? (5 Marks)

(c) Write a declaration for a 2-dimensional vector 'V' of characters containing 4 by 5 components in:
(i) C++ (ii) Pascal (4 Marks)

4(a) Give relevant reasons why natural languages are not suitable for programming computers applications. (4 ½ Marks)

(b) What are the benefits of Data Structure in Computer programming? (4 ½ Marks)

(c) Carefully explain the concept of 'union' as a data structure in C++. (6 Marks)

5 (a) Why do you think Algo 60 is the least widely used compare to its contemporary? (3 Marks)

(b) How does dynamic type checking differ from static type checking? (4 Marks)

(c) Differentiate between arguments passed by value and by reference (3 Marks)

(d) Consider the program below:

```
#include <iostream>
using namespace std;
void duplicate (int& a, int& b, int c)
{
        a*=3;
        b*=2;
        c*=8;
        }
        int main ()
{
        int x=15, y=25, z=17;
        duplicate (x, y, z);
cout << "x=" << x << ", y=" << y << ", z=" << z;
                return 0;
              }
```

(i) Why are arguments a and b containing ampersand sign (&)? (2 Marks)

(ii) What are the values of variables a, b and c after the execution of the program? (3 Marks)

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DEPARTMENT OF COMPUTER SCIENCE
2018/2019 B.Sc. DEGREE HARMATTAN SEMESTER EXAMINATION IN COMPUTER SCIENCE

COURSE TITLE: PARALLEL COMPUTING NO.OF CREDIT: 2
COURSE CODE: CSC 426 LEVEL: 400 TIME: 1½HRS
INSTRUCTIONS: ANSWER QUESTIONS 1 AND ANY OTHER 2

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1. A What is Parallel Computing? State any five examples of state of affairs in the natural world, many complex, interrelated events happening at the same time, yet within a sequence.
   B List ten (10) commercial applications that are providing an equal or greater diving force in the development of faster computers.
   C Identify the factors that limits the speed-up of parallel algorithms.

2. A What is a Parallel system?
   B What are the performance metrics of parallel systems?
   C List the classification of parallel machine according to Flynn's taxonomy; briefly describe each of this classification.

3. A What do you mean by inter processor communication in parallel machine?
   B What is pipelining? What is super-scalar Execution?
   C What is pipelining? Describe the speed-up gain due to pipelining.

4. A Differentiate between UMA and NUMA.
   B Differentiate between shared and distributed memory.
   C Explain the data parallel Models.

5. A Differentiate between processes and processors.
   B State Amdahl's law. What is the implication of Amdahl's law?
   C What is scalability of a parallel system?

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2018/2019 B.Sc. DEGREE RAIN SEMESTER EXAMINATION IN COMPUTER SCIENCE

COURSE CODE: CSC 422 COURSE UNIT: 2 LEVEL: 400 TIME: 2HRS
COURSE TITLE: DATA COMMUNICATION AND INFORMATION THEORY
INSTRUCTIONS: ANSWER QUESTION **ONE** AND ANY OTHER **TWO** QUESTIONS

QUESTION 1

a) (i) What do you understand by Fourier analysis and Fourier synthesis? (ii) Discuss in detail the concept of Fourier transform.
b) (i) What is Fourier series? (ii) List four applications of Fourier analysis.
c) Assuming Cyclic Redundancy Check (CRC) was used as an error detection technique during the transmission of the bits 1101011011 using predetermined divisor bits 10011.
(i) Compute the CRC value from the information given in (c) above
(ii) Which condition will make the bits to be rejected at the receiving node using CRC technique?
d) (i) What is wavelet transform? (ii) Highlight the differences between Fourier transform and Wavelet transform.
e) Describe, using square wave diagrams, how the bits 01111110 can be encoded using the following encoding techniques
(i) Manchester
(ii) Differential Manchester

(25 marks)

QUESTION 2

a) (i) What is data communication? (ii) Briefly discuss the basic building blocks of data communication.
b) Discuss the three major techniques for converting analog data to analog signals.
c) List and discuss four key elements of a communication model.
d) Suppose a communication line has bandwidth of 5000Hz with five signal levels. Assuming the signal-to-noise ratio is estimated at 2165. Calculate:
(i) Nquist bit rate, if the channel is assumed noiseless
(ii) Shannon channel capacity, assuming the channel is noisy.

($17^{1/2}$ marks)

QUESTION 3

a) List and discuss the two types of errors that can occur during digital data transmission.
b) Discuss the following encoding techniques
(i) Return to Zero (ii) Unipolar (iii) Alternate Mark Inversion
c) Discuss four design factors relating to transmission medium and signal.
d) With the aid of a well-labeled diagram, describe a simplified data communication model.

($17^{1/2}$ marks)

QUESTION 4

a) (i) What do you understand by parallel transmission? (ii) Discuss, in a tabular form, the major differences between parallel and serial transmission.
b) Discuss the following Unshielded Twisted Pair (UTP) cables
   (i) Category 5e (ii) Category 6 (iii) Category 5
c) Discuss in detail the statistical time division multiplexing.
d) Briefly discuss three forms of data flow.

($17^{1/2}$ marks)

QUESTION 5

a) (i) What do you understand by multiplexing? (ii) Discuss frequency division multiplexing.
b) Write short notes on the following
   (i) White noise (ii) Induced noise (iii) Impulse noise
c) Discuss the following digital-to-analog modulation techniques
   (i) Amplitude Shift Keying (ii) Frequency Shift Keying (iii) Phase Shift Keying
d) Differentiate between coaxial cable and optical fiber.

($17^{1/2}$ marks)

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2018/2019 BSc. DEGREE HARMATTAN SEMESTER EXAMINATION IN COMPUTER SCIENCE

COURSE CODE: CSC 448 NO. OF CREDITS: 2

COURSE TITLE: ARTIFICIAL INTELLIGENCE TIME: 2 HOURS

INSTRUCTION: ANSWER ANY THREE (3) QUESTIONS.

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1. (i) Define the following terms in your own words:
   (a) Intelligence
   (b) Artificial Intelligence
   (c) Expert System
   (d) Language

   (ii) What is an Agent?

   (iii) Give a diagrammatic illustration of how Agents interact with their environment.

2. (i) What is Communication?

   (ii) State and briefly describe the types of Languages.

   (iii) State and briefly explain seven (7) processes of Communication.

3. (i) Define Knowledge Engineering.

   (ii) With the aid of a diagram, describe the Knowledge Representation Framework.

   (iii) Draw the Parse tree for the sentence "The dog is dead".

4. (i) Describe the main components of an Expert System.

   (ii) With the aid of a diagram, describe the Knowledge-based System Architecture.

   (iii) State and briefly explain four (4) major roles of people involved with a Knowledge-based System.

5. (i) What do you understand by the concept of "Searching" in Artificial Intelligence.

   (ii) State and briefly explain the factors involved in the formulation of a problem in the Search Space.

   (iii) With the aid of a diagram, explain the fundamental types of Search Algorithms in Artificial Intelligence.

University of Ilorin
Faculty of Communication and Information Sciences
Department of Computer Science
2018/2019 Second Semester B.Sc. Degree Examination in Computer Science

Course code: CSC 446; Course title: Computer Graphics .
Credit unit: 2; Course status: Compulsory. Time Allowed: 2 hours.

Instruction: Attempt any Four(4) questions.

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1. (a) Explain the Bresenham's line generation algorithm.

   (b) Derive and use the Bresenham's line drawing algorithm to find the intermediate points between (1,1) and (6,7).
   (c) What is the equation of a line passing through the points:
   (i) (3,8) and (12,2)
   (ii) (0,0) and (4,6)

2. (a) Comment on the components of computer graphics?
   (b) What are the characteristics of computer graphics.
   (c) Discuss the application area of computer graphics?
   (d) Write short note on the following terms:
   (i) Pixel; (ii) Memory Mapping; (iii) Resolution; (iv) Screen size; and
   (v) Coordinates.

3. (a) Describe the following terms:
   (i) point; (ii) lines; (iii) shapes.
   (b) What is Digital Differential Analyzer (DDA) Algorithm?
   (c) List the advantages and disadvantages of the DDA algorithm.
   (d) Derive and use Digital Differential Analyzer (DDA) Algorithm to find the intermediate points between:
   (i) (0,0) and (4,6).
   (ii) (3,8) and (12,2).

4. (a) Define Computer Graphics
   (b) Differentiate between manual drafting and computer graphics
   (c) What are the advantages of computer graphics?
   (d) Comment on the classification of computer graphics.

5. Discuss the following categories of Computer Graphics Interactive devices:
   (a) the physical devices; and
   (b) the Logical devices.

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2018/2019 B.Sc. DEGREE RAIN SEMESTER EXAMINATION IN COMPUTER SCIENCE

COURSE TITLE: Mobile and Cloud Computing **LEVEL: 400**
COURSE CODE: CSC 452 **No of Credit: 2**
TIME ALLOWED: 2 HOURS
INSTRUCTION: ANSWER ONE QUESTION FROM SECTION A AND TWO QUESTIONS FROM SECTION B

SECTION A

1. **(a)** Define the term Mobile Computing. **(2 Marks)**
   (b) How does Mobile Computing differ from wireless networking? **(5 Marks)**
   (c) Explain the role of Mobile Computing in Stock Information control. **(5 Marks)**
   (d) State and briefly explain five (5) advantages and three (3) disadvantages of Mobile Computing. **(8marks)**

2. **(a)** Briefly explain the three (3) main concepts involve in Mobile Computing. **(6 Marks)**
   (b) What is the full meaning of the following (i) FDMA (ii) TDMA (iii) CDMA (iv) SDMA? **(4 Marks)**
   (c) Mention two (2) major differences between Narrowband Systems and Wideband Systems. **(4 Marks)**
   (d) State three (3) programming languages and two (2) operating systems used in Mobile Computing Applications. **(6 Marks)**

SECTION B

3. **(a)** Describe the evolution of Cloud Computing, explaining the benefits and risks involved from its evolution. **(8marks)**
   (b) There are certain deployment models working behind the scene making the cloud computing feasible and accessible to end users, describe four of these models. **(8marks)**
   (c) Explain the four (4) key characteristics of cloud computing. **(4marks)**

4. **(a)** Describe the Cloud Computing Tactics Planning and the Deployment Phases. **(6marks)**
   (b) Describe the front end and the back end of a cloud computing Architecture. **(6marks)**
   (c) Discuss four (4) technologies that are working behind the cloud computing platforms making cloud computing flexible, reliable and usable. **(8marks)**

5. **(a)** Service Models are the reference models on which the Cloud Computing is based, describe five (5) of these models. **(15marks)**
   (b) Describe five cloud infrastructural components. **(5marks)**

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COURSE TITLE: MODELLING AND SIMULATION **NO.OF CREDIT: 2**
COURSE CODE: CSC 432 **LEVEL: 400** **TIME: 1½HRS**
INSTRUCTIONS: ANSWER ANY THREE (3) QUESTIONS

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1. (a) i What is a model?
   ii What is the goal of a model and why do we build models?

   (b) Depending on how models can be represented, state and briefly different kinds of models

   (c) Identify three common sources of problems when using simulation.

2. (a) What is an Experiment? Identify a number of practical problems associated with performing an experiment

   (b) What is a system? What reasons can there be to study a system?

   (c) In order to build mathematical models of systems, what are the likely sources of general system-related knowledge?

3. (a) What is computer simulation?

   (b) Justify a number of good reasons to perform simulations instead of performing experiments on real systems.

   (c) Describe different methods of analysing models

4. Write short but concise notes on the following:
   (i) Dynamic vs. Static Models
   (ii) Continuous-Time vs. Discrete-Time Dynamic Models
   (iii) Quantitative vs. Qualitative Models

5. (a) Describe different stages of modelling
   (b) State ten (10) areas of application of modelling and simulation
   (c) Explain the following terms
   i Entity ii State iii Event iv Attribute