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Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering
3rd Year 2nd Semester B.Sc. Engineering Examination-2017

Course Title: Microprocessor and Assembly Language

Course Code: CSE 362

Total Marks: 60

Time: 3 (three) Hours

N.B.

- i) Answer **SIX** questions taking any **THREE** from each Section, ii) All questions are of equal values.
iii) Use separate answer script for each section

Section: A

1. (a) What is Microprocessor? Discuss briefly historical evaluation of microprocessor. 5
(b) What type of applications are the RISC microprocessor used for? 2
(c) What are the basic differences between microprocessor and microcontroller? 3
2. (a) How physical address calculation done in 8086? Give example. 4
(b) What the physical significance of offset and segment address of 8086 microprocessor? 4
(c) What do you know about addressing mode? Identify the addressing mode for each of the following 2
instructions.
i) MOV [BX+SI], BP
ii) MOV [1234H], AX
iii) MOV ARRAY [BX], AX
3. (a) Draw the schematic diagram of a static memory cell and explain its operation. 4
(b) Write down the difference between static and dynamic RAM. 3
(c) Construct a 6k byte RAM using 1k byte RAM chips using linear decoding. 3
4. (a) Draw the block diagram of 8237 DMA controller along with associated logic and explain its role as 7
slave and a master. 3
(b) Explain the mode of operation determined by bits 7 and 6 of 8237 channel's mode register.

Section: B

5. (a) Describe briefly synchronous and asynchronous serial communication 4
(b) Describe the format of mode register of 8251A. 3
(c) What is interrupt? Describe the classification of interrupt. 3
6. (a) Define 2-key lockout and N-key rollover. 2
(b) Draw the general structure of the Intel-8279 keyboard display controller. 3
(c) Illustrate how a 64-key keyboard and a 8-digit seven segment display can be connected to an 8279. 5
7. (a) Describe rotation instruction of 8086. Give example of five rotation instruction. 5
(b) Describe calling of a subroutine. 5
8. Determine the effect of each one of the following 8086 instructions: 1
PUSH[BX], DIV DH, CWD, MOVSB, MOV START [BX],AL
Assume the following data prior to execution of each one of the instructions independently. Assume all numbers in hexadecimal.

[DS]=3000H	[SI]=0400H	[36000H]=02H
[ES]=5000H	[DI]=0500H	[36001H]=03H
[DX]=0400H	DF=0	[50500H]=05H
[SP]=5000H	[BX]=6000H	[30400H]=02H
[SS]=6000H	START=05H	[30401H]=03H
[AX]=00A9H		

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science & Engineering Department
3rd Year 2nd Semester B.Sc. Engineering Examination-2017

Course No: CSE 350

Full Marks: 60

N.B.

Course Title: Computer Graphics

Time: 3 hours

- i) Answer **SIX** questions, taking any **THREE** from each section.
- ii) All questions are of equal values.
- iii) Use separate answer script for each section.

SECTION-A

- Q.1 (a) Define frame buffer, intensity and aspect ratio. 3
- (b) What is meant by region filling? What are the differences between boundary-fill-algorithm and flood-fill-algorithm? 3
- (c) Explain the operation of a shadow-mask method. 4
- Q.2 (a) Discuss the DDA algorithm for drawing a line. 5
- (b) Demonstrate Midpoint Circle generating Algorithm with example. 5
- Q.3 (a) Define 2D mirror reflection. Write the matrix form of reflection when an object is reflected with respect to X-axis. 2
- (b) Perform a 45° degree 2D rotation of triangle $X(3,4)$, $Y(2,6)$, $ZC(8,7)$ about the pivot point $P(2,2)$. 4
- (c) Magnify the triangle in 2-D with vertices $A(0,0)$, $B(2,2)$, $C(8,9)$ to twice its size while keeping $C(8,9)$ fixed. 4
- Q.4 (a) Draw the 2-D viewing transformation pipeline. 2
- (b) Explain the procedure for Cohen-Sutherland line clipping algorithm. 5
- (c) What is happened when applying all types of 2D clipping in the following figure? Explain it with appropriate figure. 3

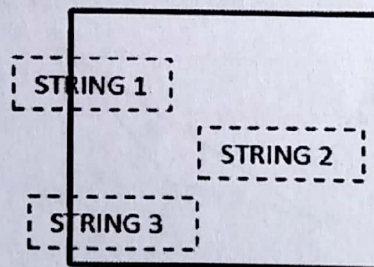
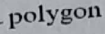


Figure-1

5



2



- 4

Department of Computer Science and Engineering
3rd Year 2nd Semester B.Sc. (Engg.) Final Examination-2017

Course No.: CSE352

Full Marks: 60

N.B.

Course Title: Compiler Design

Time: 03 hours

- i) Answer **SIX** questions, taking any **THREE** from each section.
- ii) All questions are of equal values.
- iii) Use separate answer script for each section.

Section-A

1. a) Explain the phases of a compiler for the following assignment statement: 6
 $\text{average} = (\text{height1} + \text{height2}) / 2$
- b) What do you mean by annotated parse tree? Draw the annotated parse tree for the string "100 - 50 + 25" by using the following CFG: 4

Productions:

$\text{expr} \rightarrow \text{expr} + \text{term}$

$\text{expr} \rightarrow \text{expr} - \text{term}$

$\text{expr} \rightarrow \text{term}$

$\text{term} \rightarrow 0$

$\text{term} \rightarrow 1$

....

$\text{term} \rightarrow 9$

Semantic Rules:

$\text{expr.t} := \text{expr.t} \parallel \text{term.t} \parallel '+'$

$\text{expr.t} := \text{expr.t} \parallel \text{term.t} \parallel '-'$

$\text{expr.t} := \text{term.t}$

$\text{term.t} := '0'$

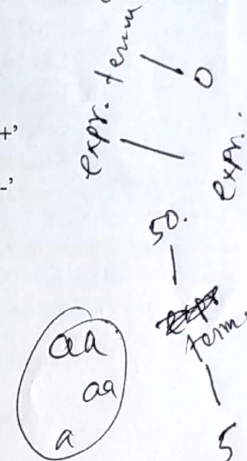
$\text{term.t} := '1'$

....

$\text{term.t} := '9'$

expr.t

Handwritten:
 $\text{expr} \rightarrow \text{expr term}$
 $\text{term} \rightarrow \epsilon$



2. a) Design DFA for the following language: 4
 "All strings of lowercase letters in which the letters are in ascending lexicographic order."
- b) For the NFA of Fig-2.1, indicate all the paths labeled aabb. Does the NFA accept aabb? Explain the answer 4

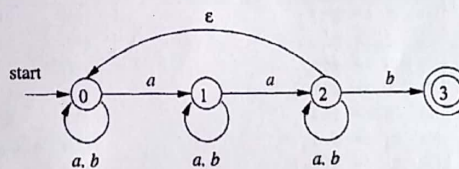


Fig-2.1: An NFA.

- c) What do you mean by dependency graph and evaluation order? Give examples. 2
3. a) What do you mean by ambiguity of a grammar? Show that the following grammar is ambiguity. 2
 $\text{list} \rightarrow \text{list} + \text{list}$
 $\text{list} \rightarrow \text{list} - \text{list}$
 $\text{list} \rightarrow 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$
- b) Construct a context-free grammar for roman numerals. 4
- c) Construct a syntax-directed translation scheme that translates postfix arithmetic expressions into equivalent prefix arithmetic expressions. 4
4. a) Describe the languages denoted by the following regular expressions: 5
 i. $a(a|b)^*a$ ii. $((\epsilon|a)b^*)^*$ 5
- b) Write regular definitions for the following languages: 5
 i. All strings of lowercase letters that contain the five vowels in order.
 ii. All strings of a's and b's that do not contain the subsequence abb.

Section-B

5. a) Consider the context-free grammar: 6
 $S \rightarrow SS + \mid SS * \mid a$

and the string aa^+a^* .

- Give the rightmost derivation for the string.
 - Give a parse tree for the string.
 - Is the grammar ambiguous or not? Justify your answer.
- b) The following grammar generates programs, represented by the non-terminal P. Consisting of a sequence of declarations D following by a single expression E.

$P \rightarrow D; E$

$D \rightarrow D; D \mid id; T$

$T \rightarrow \text{char} \mid \text{integer} \mid \text{array} [\text{num}] \text{ of } T \mid T^*$

$E \rightarrow \text{literal} \mid \text{num} \mid id \mid E \text{ mod } E \mid E [E] \mid E \uparrow$

Write the type checking expression for the all bodies of E.

Consider the grammar:

$S \rightarrow SS^+ \mid SS^* \mid a$

- Left factor this grammar.
- In addition to left factoring, eliminate left recursion from the original grammar.
- Compute FIRST and FOLLOW after eliminating the left recursion.
- Generate a predictive parsing table for this grammar.

iv. Generate a bottom-up parses for the input string 00011, according to the following grammar:

$S \rightarrow 0S1 \mid 01$

b) Construct the DAG with mentioning the steps for the following expression:

$((x+y) - ((x+y) * (x-y))) + ((x+y) * (x-y))$

c) Find the instruction cost for the following instructions.

(i) MOV b, R0

ADD c, R0

MOV R0, a

(ii) MOV Mj, R

MOV b, a(R)

8. a) For the three address code shown fig-8(a) identify the basic blocks and draw the flow graph.

(1) $i := m-1$	(16) $t_7 := 4 * i$
(2) $j := n$	(17) $t_8 := 4 * j$
(3) $t_1 := 4 * n$	(18) $t_9 := a[t_1]$
(4) $v := a[t_1]$	(19) $a[t_7] := t_9$
(5) $i := i+1$	(20) $t_{10} := 4 * j$
(6) $t_2 := 4 * i$	(21) $a[t_{10}] := x$
(7) $t_3 := a[t_2]$	(22) goto (5)
(8) if $t_3 < v$ goto (5)	(23) $t_{11} := 4 * i$
(9) $j := j-1$	(24) $x := a[t_{11}]$
(10) $t_4 := 4 * j$	(25) $t_{12} := 4 * i$
(11) $t_5 := a[t_4]$	(26) $t_{13} := 4 * n$
(12) if $t_5 > v$ goto (9)	(27) $t_{14} := a[t_{13}]$
(13) if $i >= j$ goto (23)	(28) $a[t_{12}] := t_{14}$
(14) $t_6 := 4 * i$	(29) $t_{15} := 4 * n$
(15) $x := a[t_6]$	(30) $a[t_{15}] := x$

Fig-8(a)

b) Construct the flow graph for the following intermediate codes:

- $i = 2$
- if $i > n$ goto(7)
- $t1 = i * 4$
- $a[t1] = \text{TRUE}$
- $i = i + 1$
- goto(2)
- count = 0
- $s = \text{sqrt}(n)$
- $i = 2$
- if $i > s$ goto EXIT
- $t2 = i * 4$
- if False $a[t2]$ goto(20)
- count = count + 1
- $j = 2 * i$
- if $j > n$ goto(20)
- $t3 = j * 4$
- $a[t3] = \text{FALSE}$
- $j = j + i$
- goto(15)
- $i = i + 1$
- goto(10)

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science & Engineering
3rd Year 2nd Semester B.Sc. Engineering Examination-2017

Course Title: Java Technology

Full Marks: 60

N.B.

Course Code: CSE360

Time: 3(Three) Hours

i) Answer SIX questions, taking any THREE from each section.

ii) All questions are of equal values.

iii) Use separate answer script for each section.

SECTION-A

- Q.1 (a) "Java program can be written once, and run on almost any platform" – briefly explain this statement taking the components of java architecture into account. 3
- (b) Briefly describe Encapsulation, Polymorphism, and Inheritance with real life example. 3
- (c) The following program is supposed to compute the product of all the digits of an integer $n > 0$. Fill in the blanks appropriately. 4

```
class product
{
    public static void main(String args[])
    {
        int n;
        // we assign some positive integer value to n here.
        int temp = n;
        int digit = 0;
        int product;
        product = _____ ;
        while(temp > _____ )
        {
            digit = _____ ;
            temp = _____ ;
            product = _____ ;
        }
        System.out.println("The product of the digits of ''+n+'' is '''+product);
    }
}
```

- Q.2 (a) "A class is a logical construct while an object has physical reality" – why? 2
- (b) State the difference between primitive variables of primitive data types and object types. 3
- (c) Translate the following algorithm into Java code: 5

Step1: Declare a double variable named miles with initial value 100

Step2: Declare a double constant named KILOMETERS_PER_MILE with value 1.609

Step3: Declare a double variable named kilometers, multiply miles and KILOMETERS_PER_MILE, and assign the result to kilometers.

Step4: Display kilometers to the console.

- Q.3 (a) Explain the functions of 'this' and 'final' keyword. 2
- (b) Explain the difference between abstract class and interface. What is wrong with the following interface? Fix the error (if any). 4

```
public interface SomethingIsWrong
{
    void aMethod(int aValue)
    {
        System.out.println("Hi Java");
    }
}
```

- (c) Write a Java program that prints your first name from your full name.
(Note: Your name has three parts: first name, last name and middle name.) 4

- Q.4 (a) Write down the difference between constructor and method in java. 2
- (b) What are types of constructor? Explain constructor overloading in java with example. 3
- (c) What is wrong with this following code? Explain. What would be the output after correcting this program? 5

```
class Alpha {
String getType() {
    return "alpha";
}
}
class Beta extends Alpha {
String getType() {
    return "beta";
}
}
class Gamma extends Beta {
String getType() {
    return "gamma";
}
}
public static void main(String[] args) {
Gamma g1 = new Alpha();
Gamma g2 = new Beta();
System.out.println(g1.getType() + " " + g2.getType());
}
}
```

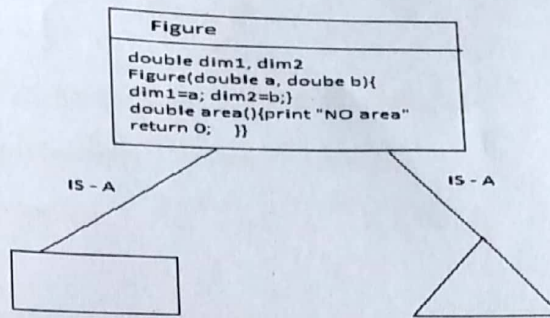
SECTION-B

- Q.5 (a) What is inheritance? Explain different types of inheritance in java. 3
- (b) Complete this program and write down the output produced from your complete program: 3

```
public class SuperClass {
double width;
double height;
double depth;
SuperClass(){
}
SuperClass(double w, double h, double d){
    _____;
    _____;
    _____;
}
void getVolume(){
double volume = _____;
System.out.println("The Volume is :" + volume);
}
}
public class _____ extends SuperClass{
double weight;
SubClass(){
}
SubClass(_____){
    _____;
weight = m;
}
}
public class Calculate {
public static void main(String [] args){
SubClass vol = _____;
SuperClass mainC = _____;
vol.getVolume();
}
}
```

(c) Write Java classes using following figure.

4



- Q.6 (a) What is a thread in java? Write down the difference between a multithreaded program and a multitasking program in java. 4
- (b) Write down the concept for Multiple Threads on single and multiple CPUs 2
- (c) Draw and describe the Thread States in Java. 4
- Q.7 (a) What are differences between Swing and AWT? 3
- (b) Describe process to use Create, Configure, Add and listen to JButton as a GUI component in java. 3
- (c) What is an Event? Describe Event with respect to button ActionEvent and ActionListener. 4
- Q.8 (a) Differentiate : 5
- Between JComboBox and JList
 - Between JTextField and JTextArea
 - Among JMenu, JMenuItem and JMenuBar.
- (b) Write a java statement to declare and define a GridLayout object with 2 rows and columns 1
- (c) Write a program that illustrates the application of multiple catch statement. 4