

Department of Advanced Science and Technology
University of Computer Studies, Mandalay
Fourth Year B.C.Sc.
Semester II Examination
Programming Languages (CS-4032)
September, 2023

Answer all questions.

Time allowed: 3 hours

- I. Answer the following questions. (15 Marks)
- Define the meaning of parsing and what are the two classes of parser?
 - What is variable and how can a variable be characterized?
 - Describe about two type conversions with examples.
 - What is two-ways selection statement and describe the general form of a two-ways selector?
 - What referencing environment for executing the passed subprogram should be used in the languages that allow nested subprogram?
- II. (a) What are potential benefits of studying concepts of programming languages? (6 Marks)
- (b) What is a list of programming language evaluation criteria for the development of software controversial? (4 Marks)
- (c) Briefly explain about character string types. (10 Marks)
- III. (a) Perform the pairwise disjointness test for the following grammar rules. (3 Marks)
- $A \rightarrow aB \mid BAb$
 $B \rightarrow aB \mid b \mid C$
 $C \rightarrow ac$
- (b) Show a complete parse, including the parse stack contents, input string, and parsing action for the string $(id * id) + (id)$, using the following grammar and parse table. (12 Marks)
- $E \rightarrow E + T$
 - $E \rightarrow T$
 - $T \rightarrow T * F$
 - $T \rightarrow F$
 - $F \rightarrow (E)$
 - $F \rightarrow id$

	Action							Goto		
State	id	+	*	(	)	\$		E	T	F
0	S5			S4				1	2	3
1		S6				Accept				
2		R2	S7		R2	R2				
3		R4	R4		R4	R4				
4	S5			S4				8	2	3
5		R6	R6		R6	R6				
6	S5			S4					9	3
7	S5			S4						10
8		S6			S11					
9		R1	S7		R1	R1				
10		R3	R3		R3	R3				
11		R5	R5		R5	R5				

- IV. (a) Assume the following JavaScript program was interpreted using static-scoping rule. What values of x and y are declared in the function sub1? Under dynamic-scoping rule, what values of x and y are declared in the function sub1? (5 Marks)

```
//main program
var x,y;
function sub1( ) {
    document.writeln("x= "+x+" ");
    document.writeln("y= "+y+" ");
}
function sub2( ) {
    var x;
    x=10;
    sub1( );
}
y=9;
x=5;
sub2( );
```

- (b) Consider the following program, written in JavaScript-like syntax: (10 Marks)

```
//main program
var r,g,b;
function color1( ) {
    var w,g,b;
    ...
}
function color2( ) {
    var w,y,b;
    ...
}
function color3( ) {
    var w,r,p;
    ...
}
function color4( ) {
    var v,w,y,o;
    ...
}
```

Given the following calling sequences and assuming that dynamic scoping is used, what variables are visible during execution of the last function called? Include with each visible variable name of the function in which it was defined.

- (i) main calls color1; color1 calls color2; color2 calls color3.
- (ii) main calls color2; color2 calls color4.
- (iii) main calls color1; color1 calls color3.
- (iv) main calls color4; color4 calls color3; color3 calls color1.
- (v) main calls color1; color1 calls color4; color4 calls color2.

- V. (a) Let the function fun be defined as: (5 Marks)

```
int fun(int*m) {
    *m += 6;
    return 5 * (*m) - 1;
}
void main( ) {
    int i = 20, j = 20, sum1, sum2, sum3;
    sum1 = (i / 2) + fun(&i);
```

```

    sum2 = fun(&j) + (j / 2);
    sum3 = sum1 + sum2;
}

```

When the operands in the expressions are evaluated left to right, what are the values of sum1, sum2 and sum3? When the operands in the expressions are evaluated right to left, what are the values of sum1, sum2 and sum3?

- (b) Using the given grammar, draw parse trees for the following expressions. Show the order of evaluation for the following expressions associate with left to right order by parenthesizing all sub expressions and placing a superscript on the right parenthesis to indicate order. (10 Marks)

```

<expr> → <expr> or <e1> | <expr> xor <e1> | <e1>
<e1> → <e1> and <e2> | <e2>
<e2> → <e2> = <e3> | <e2> /= <e3> | <e2> < <e3> | <e2> <= <e3> | <e2> >= <e3> | <e2> > <e3> | <e4>
<e3> → - <e3> | <e4>
<e4> → <e4> + <e5> | <e4> - <e5> | <e4> & <e5> | <e4> mod <e5> | <e5>
<e5> → <e5> * <e6> | <e5> / <e6> | not <e5> | <e6>
<e6> → p | q | r | s | t | const | (<expr>)

```

- (i) $(p - q) / r \& (s * t / p - 8)$
(ii) $(p + r) / q \& p * s - t$

- VI. (a) Rewrite the following pseudo code segment using a loop structure in Java. (10 Marks)

```

k = (j + 13.0) / 27.0
loop:
    if k > 10.0 then goto out
    k = k + 1.5
    i = 3.2 * k - 1.0
    goto loop
out: ...

```

- (i) Assume all variables are float type.
(ii) Assume all variables are double type.

- (b) Consider the following program written in C syntax: (5 Marks)

```

void multiply(int num_one, int num_two)
{
    num_one = num_one * 8;
    num_two = num_one * num_two - 1;
}
void main()
{
    int first_num, second_num;
    first_num = 12;
    second_num = 11;
    multiply(first_num, second_num);
}

```

For each of the following parameter-passing methods, what are the values of first_num and second_num after execution?

- (i) Passed by value.
(ii) Passed by reference.

- (c) Consider the execution of sub2 when it is called in sub4. What is the value of x by assuming shallow binding? If deep binding is used, what value of x is printed? If ad hoc binding is used, what value of x is printed? (5 Marks)

```
function sub1() {  
    var x;  
    function sub2() {  
        alert(x); // Creates a dialog box with the value of x  
    };  
    function sub3() {  
        var x;  
        x = 3;  
        sub4(sub2);  
    };  
    function sub4(subx) {  
        var x;  
        x = 4;  
        subx();  
    };  
    x = 1;  
    sub3();  
};
```
