VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD-31
B.E 4/4 (CSE-A) I-SEMESTER
Department of Computer Science and Engineering
Name of the Subject: Compiler Construction
Assignment –III **DOS: 6-5-2024**

S.no	Question	Marks	Blooms Taxonomy	Mapped	
				CO	PO
Set-1 **Roll numbers 1602-21-733-013,1602-21-733-036,1602-21-733-032,1602-21-733-037,1602-21-733-012,1602-21-733-026,1602-21-733-063,1602-21-733-005,1602-21-733-020 1602-21-733-029answer the following Questions**					
1	Construct the DAG and identify the value numbers for the sub expressions of the following expression, assuming + associates from the left :a+a+(a+a+a+(a+a+a+a))	1	3	3	1,2
2	Design a syntax-directed definition to translate infix expressions into postfix expressions without redundant parenthesis. For eg, since + and * associate to the left, ((a*(b+c))*(d)) can be rewritten as a*(b+c)*d	1	3	3	1,2
3	Consider the following translation scheme. S →ER R →*E {print ('*');}R|ε E →F + E {print ('+');}|F F →(S)|id {print (id.value);} Here id is a token that represents an integer and id.value represents the corresponding integer value. For an input '2 * 3 +4', what is the output?	2	3	1	1,2
4	Self-Organizing list symbol table implementation is best suited if access time is to be minimum. Justify your answer	1	3	1	1,2
Set-2 **Roll numbers 1602-21-733-001,1602-21-733-002,1602-21-733-003,1602-21-733-004,1602-21-733-006,1602-21-733-007,1602-21-733-008 answer the following Questions**					
1	Let synthesized attribute 'val' give the value of the binary number generated by S in the following grammar. For example, on input 101.101, S.val =5.625 S-> L.L/L L->LB/B	1	3	3	1,2

	B->0/1 Construct SDT to determine S.val using only synthesized attributes.				

2	Consider the following code which computes the inner product of 2 vectors:
	prod := 0;
	i := 1;
	repeat {
	prod := prod + a[i] * b[i]
	i = i+ 1;
	until i> 20
	}
	Below is possible IR for this program:
	
	(1) prod := 0
	(2) i := 1
	(3) t1 := 4 * i
	(4) t2 := a[t1]
	(5) t3 := 4 * i
	(6) t4 := b[t3]
	(7) t5 := t2 * t4
	(8) t6 := prod + t5
	(9) prod := t6
	(10) t7 := i + 1
	(11) i := t7
	(12)ifi<= 20 goto (3)
	(13) …
	Create Basic Blocks and the Control Flow Graph
		1	3	5	1,2

3	Construct the three address code for the following expression if a<b then t=1 else e=0	1	3	3	1,2

4	Consider the following code segment.
	x = u - t;
	y = x * v;
	x = y + w;
	y = t - z;
	y = x * y;
	Find the minimum number of total variables required to convert the above code segment to static single assignment form.
		1	3	3	1,2

SET-3 Roll numbers 1602-21-733-009 1602-21-733-010 1602-21-733-011 1602-21-733-014 1602-21-733-015 1602-21-733-016 1602-21-733-017 answer the following Questions					

1	Develop the three address code for the following c program:
	main()
	{
	inti=1
	int a[10];
	While(i<=10)
	a[i]=10;
	}
		1	3	3	1,2

2	Consider the syntax directed definition below with the synthesized attribute val, construct the annotated parse tree for the expression (3+4)*(5+6): L->E {L.val=E.val} E->T {E.val=T.val} E->E1+T {E.val=E1.val+T.val} T->F {T.val=F.val} T->T1*F {T.val=T1.val*F.val} F->(E) {F.val=E.val} F->digit {F.val=digit. Lex val}.	1	3	3	1,2
3	Consider the expression (a−1)∗(((b+c)/3)+d))(a−1)∗(((b+c)/3)+d)). Let X be the minimum number of registers required by an optimal code generation (without any register spill) algorithm for a load/store architecture, in which (i) only load and store instructions can have memory operands and (ii) arithmetic instructions can have only register or immediate operands. What is the value of X?	1	3	5	1,2
4	Consider the basic block given below. a =b+ c c =a+ d d =b+ c e= d- b a =e+ b What is the minimum number of nodes and edges present in the DAG representation of the above basic block?	1	3	5	1,2
SET-IV Roll numbers 1602-21-733-018 1602-21-733-019 1602-21-733-021 1602-21-733-022 1602-21-733-023 1602-21-733-024 1602-21-733-025 answer the following Questions					

1	Develop an SDD for translating array references and translate the following statement into three address code X= a[i] + b[j]	2	3	3	1,2
2	Consider the program given below, in a block-structured pseudo-language with lexical scoping and nesting of procedures permitted. Program main; Var ... Procedure A1; Var ... Call A2; End A1 Procedure A2; Var ... Procedure A21; Var ... Call A1; End A21 Call A21; End A2 Call A1; End main. Consider the calling chain: MainA1A2A21A1 Find the correct set of activation records along with their access links ?	1	3	4	1,2
3	Consider the translation scheme shown below S → T R R → + T {print ('+');} R | ε T → num {print (num.val);} Here num is a token that represents an integer and num.val represents the corresponding integer value. For an input string '9 + 5 + 2', find the output.	1	3	3	1,2

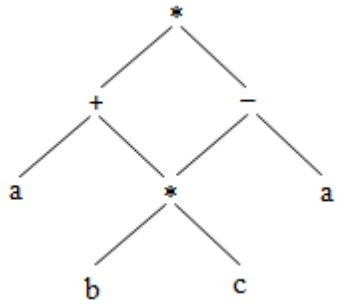
4	Construct three address code for the following ‘for loop’ in C language
	for(i=0;i<10;i++)
	{
	x=a+b*c;
	}
		1	3	3	1,2

SET-V Roll numbers 1602-21-733-027 1602-21-733-028 1602-21-733-030 1602-21-733-031 1602-21-733-033 1602-21-733-034 1602-21-733-035 answer the following Questions					
1	Construct the SDD for control flow statements and convert the following code to three address code If(x<100 || x>200 && x!=y) x=0;	1	3	3	1,2
2	If we want to support local arrays of variable size. Then identify the storage allocation that is suitable to meet the requirement. Justify your answer	2	3	4	1,2,3
3	Discuss about basic blocks and flow graphs and convert the following IR code into basic blocks and flow graphs. 1. i=1 2. j=1 3. t1=10*i 4.t2=t1+j 5.t3=8*t2 6. t4=t3-88 7. a[t4]=0.0 8. j=j+1 9. if j<=10 goto 3 10. i=i+1 11. if i<=10 goto 2 12. i=1 13. t5= i-1 14. t6=88*t5 15. a[t6]=1.0 16. i=i+1 17. ifi<=10 goto 13	1	3	5	1,2

4	Construct three address code for the following 'Switch' statement in C language
	i=1;
	switch(i)
	{
	case 1: x1=a1+b1*c1;
	break;
	case 1: x2=a2+b2*c2;
	break;
	default: x3=a3+b3*c3;
	break;
	}
		1	3	3	1,2

SET-VI Roll numbers 1602-21-733-038 1602-21-733-039 1602-21-733-040 1602-21-733-041 1602-21-733-042 1602-21-733-043 1602-21-733-044 answer the following Questions					
1	Develop the SDD for translating array references and translate the following statement into three address codeX= a[i][j] + b[i][j]	2	3	3	1,2
2	If we want to support local arrays of variable size. Then identify the storage allocation that is suitable to meet the requirement.	1	3	3	1,2
3	Consider the following expression x = a*b – c*d+e For generating target code how many register will be required apart from accumulator A?	1	3	5	1,2
4	Consider the grammar with the following translation rules and E as the start symbol. E -> E1 #T {E.value = E1.value * T.value} | T {E.value = T.value} T -> T1 & F {T.value = T1.value + F.value} |F {T.value= F.value} F ->num {F.value = num.value} Compute E.value for the root of the parse tree for the expression:2 # 3 & 5 # 6 &4	1	3	3	1,2
SET-VII Roll numbers 1602-21-733-046 1602-21-733-047 1602-21-733-048 1602-21-733-049 1602-21-733-051 1602-21-733-052 1602-21-733-053 answer the following Questions					
1	Consider the syntax directed translation scheme (SDTS) given in the following. Assume attribute evaluation with bottom-up parsing, i.e., attributes are evaluated immediately after a reduction. E→ E11 * T {E.val = E11.val * T.val} E→ T {E.val = T.val} T→ F - T11 {T.val = F.val - T11.val} T→ F {T.val = F.val} F→2 {F.val = 2} F→4 {F.val = 4} Using this SDTS, for the expression 4 – 2 – 4 * 2 evaluate its E.val.	2	3	3	1,2
2	Consider the syntax directed definition shown below. S → id : = E {gen (id.place = E.place;);} E → E1 + E2 {t = newtemp ( ); gen (t = El.place + E2.place;); E.place = t} E → id {E.place = id.place;} Here, gen is a function that generates the output code, and newtemp is a function that returns the name of a new temporary variable on every call. Assume that ti's are the temporary variable names	1	3	3	1,2

	generated by newtemp. For the statement 'X: = Y + Z', what is the 3-address code sequence generated by this definition?				
3	P → PαQ | Q Q → QβR | R R → num If 2α3α4β1α2β1 is evaluated to 18, then find the correct value for α and β by constructing SDT	1	3	3	1,2
4	Consider the following SDT. A → BC *(I) B.i = f(A.i) (II) B.i = f(A.S) (III) A.S = f(B.s) Which of the above is violating L – attributed definition?	1	3	3	1,2
SET-VIII Roll numbers 1602-21-733-054 1602-21-733-055 1602-21-733-056 1602-21-733-057 1602-21-733-058 1602-21-733-059 1602-21-733-060 answer the following Questions					
1	Consider the syntax directed definition below with the synthesized attribute val, construct the annotated parse tree for the expression (3+4)*(5+6): L->E L.val=E.val E->T E.val=T.val E->E1+T E.val=E1.val+T.val T->F T.val=F.val T->T1*F T.val=T1.val*F.val F->(E) F.val=E.val F->digit F.val=digit. Lean val.	2	3	3	1,2
2	Consider the intermediate code given below. (1) i = 1 (2) j = 1 (3) t1 = 5 * i (4) t2 = t1+ j (5) t3 = 4 * t2 (6) t4 = t3 (7) a[t4] = – 1 (8) j = j + 1 (9) if j < = 5 goto (3) (10) i = i + 1 (11) if i< 5 goto (2) The number of nodes and edges in the control-flow-graph constructed for the above code, respectively, are	1	3	5	1,2
3	Consider the following Syntax Directed Translation Scheme (SDTS), with non-terminals {S, A} and terminals {a, b}}. S->aA {print 1}	1	3	3	1,2,3

	S->a{print 2} A->Sb{print 3} Using the above SDTS, find the output printed by a bottom-up parser, for the input aab.				
4	Which symbol implementations make efficient use of memory? Justify your answer.	1	3	4	1,2,3
SET-IX Roll numbers 1602-21-733-061 1602-21-733-062 1602-21-733-064 1602-21-733-065 1602-21-733-066 1602-21-733-067 1602-21-733-135 answer the following Questions					
1	Consider the following translation scheme. S → ER R → *E{print("*");}R | ε E → F + E {print("+");} | F F → (S) | id {print(id.value);} Here id is a token that represents an integer and id.value represents the corresponding integer value. For an input '2 * 3 + 4', what is the output?	1	3	3	1,2
2	Find the least number of temporary variables required to create a three-address code in static single assignment form for the expression q+r/3+s–t*5+u*v/w ?	2	3	3	1,2,3
3	Which symbol table implementation is based on the property of locality of reference? Justify your answer.	1	3	4	1,2
4	What is the equivalent expression for the following DAG?  	1	3	5	1,2
SET-X Roll numbers 1602-21-733-136 1602-21-733-301 1602-21-733-302 1602-21-733-303 1602-21-733-304 1602-21-733-305 1602-21-733-306 1602-21-733-307 answer the following Questions					
1	For a C program accessing X[i][j][k], the following intermediate code is generated by a compiler. Assume that the size of an integer is 32 bits and the size of a character is 8 bits. t0 = i * 1024 t1 = j * 32 t2 = k * 4 t3 = t1 + t0 t4 = t3 + t2 t5 = X[t4] Write the array declaration of X	1	3	3	1,2,3

2	Consider the grammar with the following translation rules and E as the start symbol. E -> E1 #T {E.value = E1.value * T.value} | T {E.value = T.value} T -> T1 & F {T.value = T1.value + F.value} |F {T.value= F.value} F ->num {F.value = num.value} Compute E.value for the root of the parse tree for the expression:2 # 3 & 5 # 6 &4	1	3	3	1,2,3
3	Construct three address code for X[i][j] where X is of size 10*20	2	3	3	1,2
4	Consider the following grammar. S → aB | aAb A → bAb | a B → aB | ε How many back tracks are required to generate the string aab from the above grammar?	1	3	5	1,2