COLLEGE OF ENGINEERING PUNE

(An Autonomous Institute of Government of Maharashtra.)

END Semester Examination

Programme: B.Tech | **Semester: VII**

Course Code: CT-22001 | **Course Name: Compiler Construction**

Branch: Computer Engineering | **Academic Year: 2024-25**

Duration: 03 Hrs | **Max Marks: 60**

Student PRN No.

Instructions:

1. **Figures to the right indicate the full marks.**
2. **Mobile phones and programmable calculators are strictly prohibited.**
3. **Writing anything on question paper is not allowed.**
4. **Exchange/Sharing of stationery, calculator etc. not allowed.**
5. **Write your PRN Number on Question Paper.**

			Marks	CO	PO
Q 1	a	i) Give a Regular Expression and DFA for: The language { w ∈ Σ * | w has an odd number of a's }. ii) Give a RE and a DFA/NFA for the language of all strings over {0, 1} * that do not end in 01.	04	1,3,5	2,8
	b	Answer the following i. Is the following grammar ambiguous, give justification with example. S → aSbS | bSaS | ϵ ii. Eliminate left recursion from: S → (L) | a L → L, S | S	04	1,3,5	2,8
	c	Discuss the front-end and back-end model of compiler.	03	1,3,5	2,8
Q 2	a	Construct an SLR parsing table for the following grammar: R→ R | R R → RR R → R* R → (R) R→a R→b Resolve the parsing action conflicts in such a way that regular expression will be parsed normally.	06	2,3	1,2
	b	Construct the predictive parser & show the parsing table for the given grammar S → S + S| SS| (S)| S* | a and parse the string (a + a) * a	04	2,3	1,2
	c	Explain the different operations/ function for Symbol Table (ST)	02	2	6
Q 3	a	Write the 3-address code for the expression **c + a[i][j]** where *a* is a 2 X3 array of integers.	03	3	1

	b	1] Give the 3-address code in triple format for the following code segment:
		while (A < C && B > D) do
		if (A == 3) then
		C = C+1
		else
		while (A <= D) do
		A = A+3
		2] Consider the following syntax-directed definition (SDD).
		Given "MMLK" as the input, what is the CORRECT value computed by the SDD (in the attribute S.val)?
			03
			03
				3,4	2

	c	Write Syntax Directed Translation scheme for Boolean expression. Explain use of back patching with example.	04	3,4	1
Q4	a	Consider the following code and perform the following code optimization:- i. loop invariant code motion ii. common sub expression elimination iii. strength reduction	6	1,3,5	2,8
	b	Consider the following code	6		

S → DHTU	{S.val=D.val+H.val+T.val+U.val;}
D -> "M"D1	{D.val=5+D1.val;}
D -> ϵ	{D.val=−5;}
H -> "L"H1	{H.val=5 * 10+H1.val;}
H -> ϵ	{H.val=−10;}
T -> "C"T1	{T.val=5 * 100+T1.val;}
T -> ϵ	{T.val=−5;}
U -> "K"	{U.val=5;}

```
for (i=0; i<n; i++)
{
  for(j=0; j<n; j++)
  {
    if(i % 2)
    {
      x += (4 * j + 5 * i)
      y +=(7 + 4 * j)
    }
  }
}
```

```
z = x + 3 + y * f + g * h
for ( i = 0; i < 200; i = i + 2)
{
  if( z > i)
  {
    p = p + x + 3;
    q = q + y * f;
  }
  else
```

		{
		p = p + g * h;
		q = q + x + 3;
		}
		}
		If common sub expression elimination optimization is applied on the code, number of addition & multiplication in the optimized code are? Also give the optimized code.			

5	a	What are different issues in code generation ,Expalin?	04	1,5	2
	b	Consider the following code and answer the given question. I. t1 = -1 II. t2 = 0 III. t3 = 0 IV. t4 = 4 * t3 V. t5 = 4 * t2 VI. t6 = t5 * M VII. t7 = t4 + t6 VIII. t8 = a[t7] IX. if t8 <= max goto XI X. t1 = t8 XI. t3 = t3+1 XII. if t3 < M goto IV XIII. t2 = t2 + 1 XIV. if t2 < N goto III XV. max = t1 Number of Basic Blocks =_____and number of instructions in the largest Basic Block =_____? Justify your your answer.	04	4	2
	c	Write short notes on:- i. Activation records ii. Cross compilers	4	4	2

END.