

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

May-June 2026

(B. Tech)Program: Computer Engineering Scheme III

Regular Examination: TY Semester: VI

Course Code: CEC601 and Course Name: System Programming & Compiler Construction

Date of Exam: 18 /05/2026

Duration: 02.5 Hours

Max. Marks: 60

Instructions:

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any two questions out of three: (05 marks each)	10		
a)	Write sample assembly language code and show the contents of the symbol table and literal table.		CO1	AP
b)	Explain ML-based compiler optimization techniques.		CO6	U
c)	Write a LEX program to count the type of numbers(positive int , negative int, positive fraction, negative fraction)		CO2	AP
Q 2	Solve any two questions out of three: (05 marks each)	10		
a)	Given the following syntax directed translation rules: Rule 1: $R \rightarrow AB \{ B.i = R.i - 1; A.i = B.i; R.i = A.i + 1; \}$ Rule 2: $P \rightarrow CD \{ P.i = C.i + D.i; D.i = C.i + 2 \}$ Rule 3: $Q \rightarrow EF \{ Q.i = E.i + F.i; \}$ Analyse the rules for L attributed and S attributed.		CO4	AN
b)	Refer to the given 3-address code sequence. Demonstrate the basic blocks and flow graph for it. 1001: $i = 1$ 1002: $j = 1$ 1003: $t1 = 10 * i$ 1004: $t2 = t1 + j$ 1005: $t3 = 8 * t2$ 1006: $t4 = t3 - 88$ 1007: $a[t4] = 0.0$ 1008: $j = j + 1$ 1009: if $j \leq 10$ goto 1003 1010: $i = i + 1$ 1011: if $i \leq 10$ goto 1002 1012: $i = 1$ 1013: $t5 = i - 1$		CO5	U

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	1015: a[t6] = 1.0 1016: i = i+1 1017: if i <= 10 goto 1013			
c)	Consider the following simple context-free grammars: Grammar G1 Grammar G2 Grammar G3 S → A S → A S → A A → ε A → ε A → ε A → bbA A → bAb A → Abb Which of these grammar/grammars is in LL(1). Demonstrate with the parsing table and justify your answer.		CO3	U
Q.3	Solve any two questions out of three. (10 marks each)	20		
a)	What is the need of code optimization? Explain different code optimization techniques with examples.		CO5	U
b)	What is operator precedence parsing? (1M) Consider the following grammar check whether it is Operator Precedence grammar. (1M) E → E+T/T T → T*V/V V → a/b/c/d With the help of the above grammar, Prepare operator precedence table. (3M). Parse the input string "a+b*c*d". (5M)		CO3	AP
c)	i) Explain the need of system program and application program wrt a computing device. (2M) ii) List different system programs and application programs. (2M) iii) Draw and explain phases of compiler. For the string id+id*id demonstrate the output of each phase. (6M)		CO1	AP
Q.4	Solve any two questions out of three. (10 marks each)	20		
a)	S → DHTU { S.val = D.val + H.val + T.val + U.val; } D → "M" D { D.val = 5 + D.val; } D → ε { D.val = -5; } H → "L" H { H.val = 5 * 10 + H.val; } H → ε { H.val = -10; } T → "C" T { T.val = 5 * 100 + T.val; } T → ε { T.val = -5; }		CO4	AP

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	$U \rightarrow "K" \quad \{ U.val = 5; \}$ Given "MMLK" as the input, what will be the value of S computed by this SDD. (5M) Show the annotated parse tree for the same. (5M)		
b)	i) Find a regular expression corresponding to the language of all strings over the alphabet $\{ a, b \}$ that do not end with ab. (2M) ii) Draw a DFA for the language accepting strings ending with 'abb' over input alphabets $\Sigma = \{ a, b \}$ (2M) iii) For the string $w = bbaababa$, find- a) Leftmost derivation (2M) b) Rightmost derivation (2M) c) Parse Tree (2M) $S \rightarrow bB / aA$ $A \rightarrow b / bS / aAA$ $B \rightarrow a / aS / bBB$	CO2	U
c)	Compare traditional vs AI-based compilers. (5M) Explain any five AI compilers. (5M)	CO6	AN
