EUCHION FOR LIBER

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad-500043

COMPUTER SCIENCE AND ENGINEERING

TUTORIAL QUESTION BANK

Course Title	COMP	PILE	R DESIGN			
Course Code	AIT004	4				
Programme	B.Tech	1				
Semester	V	CSE	E IT			
Course Type	Core					
Regulation	IARE - R16					
	Theory Practic				ical	
Course Structure	Lectu	ires	Tutorials	Credits	Laboratory	Credits
	3		1	4	-	-
1						
Chief Coordinator	Ms. E	Uma	Shankari, Assista	nt Professor		

COURSE OBJECTIVES:

The cou	urse should enable the students to:
Ι	Apply the principles of theory of computation to the various stages in the design of compilers.
II	Demonstrate the phases of the compilation process and able to describe the purpose and operation of each phase.
III	Analyze problems related to the stages in the translation process.
IV	Exercise and reinforce prior programming knowledge with a non-trivial programming project to construct a compiler.

COURSE OUTCOMES (COs):

CO 1	Understand the various phases of compiler and design the lexical analyzer					
CO 2	Explore the similarities and differences among various parsing techniques and grammar transformation techniques.					
CO 3	Analyze and implement syntax directed translations schemes and intermediate code generation.					
CO 4	Describe the concepts of type checking and analyze runtime allocation strategies.					
CO 5	Demonstrate the algorithms to perform code optimization and code generation.					

COURSE LEARNING OUTCOMES (CLOs):

AIT004.01	Define the phases of a typical compiler, including the front and backend.
AIT004.02	Recognize the underlying formal models such as finite state automata, push-down automata and their connection to language definition through regular expressions and grammars.
AIT004.03	Identify tokens of a typical high-level programming language; define regular expressions for tokens and design and implement a lexical analyzer using a typical scanner generator.
AIT004.04	Explain the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation
AIT004.05	Apply an algorithm for a top-down or a bottom-up parser construction; construct a parser for a given context-free grammar.
AIT004.06	Demonstrate Lex tool to create a lexical analyzer and Yacc tool to create a parser.
AIT004.07	Understand syntax directed translation schemes for a given context free grammar.
AIT004.08	Implement the static semantic checking and type checking using syntax directed definition (SDD) and syntax directed translation (SDT).
AIT004.09	Understand the need of intermediate code generation phase in compilers.
AIT004.10	Write intermediate code for statements like assignment, conditional, loops and functions in high level language.
AIT004.11	Explain the role of a semantic analyzer and type checking; create a syntax-directed definition and an annotated parse tree; describe the purpose of a syntax tree.
AIT004.12	Design syntax directed translation schemes for a given context free grammar.
AIT004.13	Explain the role of different types of runtime environments and memory organization for implementation of programming languages.
AIT004.14	Differentiate static vs. dynamic storage allocation and the usage of activation records to manage program modules and their data.
AIT004.15	Understand the role of symbol table data structure in the construction of compiler.
AIT004.16	Learn the code optimization techniques to improve the performance of a program in terms of speed & space.
AIT004.17	Implement the global optimization using data flow analysis such as basic blocks and DAG.
AIT004.18	Understand the code generation techniques to generate target code.
AIT004.19	Design and implement a small compiler using a software engineering approach.
AIT004.20	Apply the optimization techniques to intermediate code and generate machine code.

TUTORIAL QUESTION BANK

	UNIT- I				
	INTRODUCTION TO COMPILERS AND PAI	RSING			
	Part - A (Short Answer Questions)				
S No	QUESTIONS	Blooms	Course	Course	
		Taxonomy	Outcomes	Learning	
		Level		Outcomes	
				(CLOs)	
1	Explain the cousins of compiler?	Understand	CO 1	AIT004.01	
2	Define the two main parts of compilation? What they perform?	Understand	CO 1	AIT004.01	
3	How many phases does analysis phase consists define it?	Understand	CO 1	AIT004.01	
4	Define and explain the Loader?	Remember	CO 1	AIT004.01	
5	Write about preprocessor?	Remember	CO 1	AIT004.01	
6	State the general phases of a compiler?	Understand	CO 1	AIT004.01	
7	Define a lexeme and token?	Remember	CO 1	AIT004.01	

8	List the issues of lexical analyzer?	Understand	CO 1	AIT004.01
9	State some compiler construction tools?	Understand	CO 1	AIT004.01
10	Define the term Symbol table?	Understand	CO 1	AIT004.01
11	Define the term Interpreter?	Remember	CO 1	AIT004.03
12	Define an error Handler in compiler?	Understand	CO 1	AIT004.01
13	Define a translator and types of translator?	Understand	CO 1	AIT004.01
14	Define parser and list its types?	Understand	CO 1	AIT004.01
15	Define bootstrap and cross compiler?	Understand	CO 1	AIT004.01
16	Define pass and phase?	Understand	CO 1	AIT004.01
17	Analyze the output of syntax analysis phase? What are the three general	Remember	CO 1	AIT004.01
	types of parsers for grammars?			
18	What are the goals of error handler in a parser?	Understand	CO 1	AIT004.01
19	Define context free grammar. When will you say that two CFGs are equal?	Remember	CO 1	AIT004.02
20	Give the definition for leftmost and rightmost derivations?	Understand	CO 1	AIT004.02
21	Define a parse tree?	Understand	CO 1	AIT004.02
22	Explain an ambiguous grammar with an example?	Remember	CO 1	AIT004.02
23	When will you call a grammar as the left recursive one?	Remember	CO 1	AIT004 02
24	Define elimination of left factoring?	Remember	CO 1	AIT004.05
25	Define back tracking?	Understand	CO 1	AIT004.05
25	Define tondown persing and its types?	Understand		AIT004.05
20	With the term with the sector and the types?	Understand	C0 1	AI1004.05
27	write about recursive descent parsing?	Understand	CO 1	AIT004.05
28	Write about predictive parser?	Understand	CO 1	AIT004.05
29	Define about FIRST and state its rules?	Remember	CO 1	AIT004.05
30	Define about FOLLOW and state its rules?	Remember	CO 1	AIT004.05
31	State the condition to check the grammar is LL(1) or not?	Remember	CO 1	AIT004.05
32	Write down the difficulties in top down parsing?	Understand	CO 1	AIT004.05
33	How to eliminating ambiguity from dangling-else grammar?	Remember	CO 1	AIT004.05
	Part - B (Long Answer Questions)			
1	Define compiler? State various phases of a compiler and explain them in	Understand	CO 1	AIT004.01
	detail?			
2	Explain the various phases of a compiler in detail. Also Write down	Remember	CO 1	AIT004.01
	the output for the following expression after each phase x: $=a+b*c-d?$			
3	Explain the cousins of a Compiler? Explain them in detail.	Understand	CO 1	AIT004.01
4	Describe how various phases could be combined as a pass in compiler?	Understand	CO 1	AIT004.01
5	For the following expression	Remember	CO 1	AIT004.01
, e	Position initial + rate *60		001	
	Write down the output ofter each phase of compiler?			
6	Exploin the role and issues of Laxiael Analyzer?	Understand	CO 1	AIT004.01
0	Explain the role and issues of Lexical Analyzer?	Understand		AIT004.01
0	Exploin single pass and multi pass compiler with exemple?	Understand		AIT004.01
8	Explain single pass and multi pass compiler with example?	Understand	<u> </u>	AIT004.01
9	Explain the general formet of a LEX measure with ensure 1-2	Diluerstallu	<u> </u>	AIT004.05
10	Explain the general format of a LEX program with example?	Remember		AIT004.06
11	Construct the predictive parser the following grammar:	Kemember	COT	AI1004.05
	S->(L) a			
	L->L,S S.			
	Construct the behavior of the parser on the sentence (a,a) using the above			
	grammar?			
12	State the limitations of recursive descent parser?	Understand	CO 1	AIT004.05
13	Consider the grammar below	Remember	CO 1	AIT004.05
	$E \rightarrow E + E \mid E - E \mid E \times E \mid E / E \mid a \mid b$			
	Obtain left most and right most derivation for the string $a+b*a-b$?			
1.4	Explain problems in top down parsing along with examples?	Understand	CO 1	AIT004.05
14				

15	Find the FIRST and FOLLOW sets for following grammar?	Remember	CO 1	AIT004.05
	$S \rightarrow ACB / CbB / Ba$			
	$A \rightarrow da / BC$			
	$B \rightarrow g/E$			
16	$C \rightarrow \Pi/C$ Explain briefly about compiler construction tools?	Remember	CO 1	AIT00/ 03
10	Explain briefly about complet construction tools?	Understand	CO 1	AIT004.05
1/	Differentiate the compiler and interpreter in detail?	Understand	CO 1	AIT004.05
10	Differentiate the compiler and interpreter in detail?	Remember	CO 1	AIT004.05
19	arammar?	Kennennber	COT	A11004.05
20	Find the FIRST and FOLLOW sets for following grammar?	Remember	CO 1	A IT00/L05
20	$S \rightarrow aBDh$	Remember	COT	AI1004.05
	$B \rightarrow cC$			
	$C \rightarrow bC/E$			
	$D \rightarrow EF$			
	$E \rightarrow g / \epsilon$			
	$F \rightarrow f/\epsilon$			
	Part - C (Problem Solving and Critical Thinking Q	uestions)		
1	Consider the following fragment of C code:	Remember	CO 1	AIT004.01
	float i. i:			
	i = i * 70 + i + 2:			
	Write the output at all phases of the compiler for above "C" code?			
2	Describe the languages denoted by the following regular expressions.	Remember	CO 1	AIT004.03
	$i_{1} (0+1)*0(0+1)(0+1)$			
	ii 0*10*10*10*			
3	Explain how LEX program perform lexical analysis to identify Identifiers	Remember	CO 1	AIT004.06
	Comments, Numerical constants, Keywords, Arithmetic operators?	remember	001	
4	Check whether the following grammar is a LL(1)grammar	Remember	CO 1	AIT004.05
	$S \rightarrow iEtS iEtSeS _{2}$			
	$E \rightarrow 0$			
5	Also define the FIRST and Follows.	Domomhor	CO 1	AIT004.05
5	answer with reasons?	Keinenidei	COT	AI1004.05
	$S \rightarrow P$			
	$L \rightarrow R$			
	$L \rightarrow id$			
	$R \rightarrow L.$			
6	Define ambiguous grammar? Test whether the following grammar is ambiguous	Remember	CO 1	AIT004.04
	or not?			
	$E \rightarrow E + E \mid E - E \mid E^*E \mid E/E \mid (E) \mid id$			
7	Prepare the predictive parser for the following grammar:	Remember	CO 1	AIT004.05
	$S \rightarrow a b (T)$			
	$T \rightarrow T S S$			
	Write down the necessary algorithms and define EIDCT and			
	FOLLOW Characteristic file and the file file file file file file file fil			
	FOLLOW. Show the behavior of the parser in the sentences,			
	i. $(a,(a,a))$			
	ii ((a a) a (a) a)			
Q	11. ((a,a),a,(a),a) Convert the following grammer into LL (1) grammer	Romamhar	CO 1	AIT004.05
0	Convert me following grammar into LL(1)grammar,	Kennennber	CUI	AI1004.05
	$S \rightarrow ABC$			
	$A \rightarrow aA C$			
	$B \rightarrow b$			
1	$ C \rightarrow c.$			

9	Write a recursive descent parser for the grammar.	Remember	CO 1	AIT004.05
	bexpr→bexpr or bterm bterm			
	$hterm \rightarrow hterm$ and $hfactor hfactor$			
	blesten west blesten (beven) itme i felee			
	blactor→not blactor (bexpr) true laise.			
1.0	Where or, and , not,(,),true, false are terminals of the grammar.		~~	A 17500 4 0 5
10	Consider the grammar,	Remember	CO 1	AI1004.05
	$E \rightarrow E + T \mid T$			
	$T \to T^*F \mid F$			
	$F \rightarrow (E) \mid id.$			
	Construct a predictive parsing table for the grammar given above			
	Verify whether the input string id \pm (id * id) is accented by the grammar or not?			
	UNIT-II			
	BOTTOM-UP PARSING			
	Part – A (Short Answer Questions)			
1	Define the term handle?	Understand	CO 2	AIT004.05
2	Define bottom up parsing?	Understand	CO 2	AIT004.05
3	Define LR(0) items in bottom up parsing?	Remember	CO 2	AIT004.05
4	LR(k) parsing stands for?	Remember	CO 2	AIT004.05
5	List types of bottom up parsing techniques?	Understand	CO 2	AIT004.05
6	Define goto function and closure function in LR parser?	Remember	CO^2	AIT004.05
7	Why SLR and LALR are more economical to construct Canonical LR?	Understand	CO^2	AIT004.05
8	Write about handle pruning?	Understand	CO 2	AIT004.05
0	What are error recovery types?	Understand		AIT004.05
9	List down the conflicts during shift reduce parsing	Understand	CO_2	AIT004.05
10	List down the connets during sint-reduce parsing.	Understand		AIT004.05
11	Write about chift reduce persing?	Understand	CO 2	AIT004.05
12	Define VACC nervor?	Understand	<u>CO 2</u>	AIT004.05
15	State the difference between CLD and LALD?	Understand	<u>CO 2</u>	AIT004.00
14	State the unreference between CLK and LALK?	Damamhar	CO 2	AIT004.05
15	Define all augmented grammar?	Remember	CO 2	AIT004.05
10	Define Shift action?	Remember	CO 2	AIT004.05
1/	Le le fe menure a l'initiation in manine d'in hettern un neurine 2instife	Kennennber Umdamatam d	<u>CO 2</u>	AIT004.05
18	Is left recursion elimination is required in bottom up parsing /justify.	Understand	CO 2	AIT004.05
19	List out difference between LL and LK parsers?	Demonstand	CO 2	AIT004.05
20	List out the operations of shift reduce parsing?	Remember	02	AI1004.05
1	Part - B (Long Answer Questions)	Domomhor	CO 2	ATT004.05
1	Explain the common conflicts that can be encountered in a shift reduce nervor?	Understand	CO 2	AIT004.03
2	Explain the common contricts that can be encountered in a sint-reduce parser?	Understand	CO 2	AIT004.04
3	Explain handle pruning in detail with example: C_{exc} is the example E_{exc} is $E + E + E + E + E + E$	Damanahan	<u>CO 2</u>	AIT004.04
4	Consider the grammar $E \rightarrow E + E E \cdot E (E) Id$	Remember	02	AI1004.04
	(id1 \pm id2)*id2 and determine whether the given string is accepted by the person or			
	(101+102) ¹ 103 and determine whether the given string is accepted by the parser of pot ⁹			
5	Demonstrate stack implementation in shift reduce parsing?	Remember	CO 2	AIT004 04
5	Explain briefly about VACC-automatic parser generator?	Remember	CO_2	AIT004.04
7	State the difference between SLR CLR and LALR parsers in detail?	Remember	CO_2	AIT004.00
/ &	Explain briefly about nanic mode and phrase level error recovery techniques?	Remember	CO_2	AIT004.04
0	Explain bow to handle the error in ambiguous grammar with example?	Understand	CO_2	AIT004.05
10	Describe I R Parsing algorithm in detail with diagram?	Understand	CO_2	AIT004.05
10	Consider the grammar	Remember	CO_2	ΔΙΤΩΩΛ Ω5
11	$P \rightarrow F$	KUIIUUU		111004.05
	$E \rightarrow E^{\pm}I$			
	$1 \rightarrow 10(E)$			
1	$1 \rightarrow 10$			

	And, check whether the following grammar is LR(0) or not?			
12	Explain briefly about shift reduce parsing algorithm?	Understand	CO 2	AIT004.05
13	Explain the following terms	Understand	CO 2	AIT004.05
	i)Canonical collection of items			
	ii)Augmented Grammar			
	iii)Closure and goto Operation			
14	Consider the grammar,	Remember	CO 2	AIT004.05
	$P \rightarrow E$			
	$E \rightarrow E+T$			
	$E \rightarrow T$			
	$T \rightarrow id(E)$			
	$T \rightarrow 1d$			
15	And, check whether the following grammar is SLR(1) or not?	Understand	CO 2	AIT004.05
15	Construct the SLP(1) persing table for the following growmer	Directstand	<u>CO 2</u>	AI1004.03
10	Construct the SLR(1) parsing table for the following grammar $S \rightarrow A_0 \mid bA_0 \mid d_0 \mid bd$	Remember	02	
17	List out the comparisons of LR parsers in detail?	Remember	CO 2	AIT004.05
18	Consider the grammar	Remember	CO 2	ATT004.05
	$S \rightarrow AS b$			
	$A \rightarrow SA \mid a$			
	Construct the collection of sets of LR(0) items for this grammar?			
19	Show that the following grammar	Remember	CO 2	AIT004.05
	$S \rightarrow AaAb \mid BbBa$			
	$A \rightarrow \in$			
	$B \rightarrow \in$			
	is SLR(1) or not?			
20	Consider the grammar	Remember	CO 2	AIT004.05
	hexpr→bexpr or hterm hterm			
	hterm hterm and hfactor hfactor			
	blesten vnet bfesten (hevrn) itme i felee			
	Clast = hother (bexpr) fute faise.			
	Check whether the grammar is CLR or hot?			
1	Part - C (Problem Solving and Critical Thinking Q	Demomber	00.0	
1	Consider the grammar given below.	Kellieliidei	02	AI1004.04
	$E \to E + \Gamma \mid T$			
	$T \rightarrow T^*F \mid F$			
	$F \rightarrow (E) \mid id.$			
	Prepare LR parsing table for the above grammar .Give the moves of LR			
	parser on id * id + id?			
2	Analyze whether the following grammar is LR(0). Explain your answer with reasons?	Analysis	CO 2	AIT004.04
	$S \rightarrow xAy xBy xAz$			
	$A \rightarrow as q$			
	$B \rightarrow a$			
3	Analyze whether the following grammar is CLR or not. Explain your answer	Remember	CO 2	AIT004.04
-	with reasons?	Analysis		
	$S \rightarrow Aa aAc Bc bBa$	1 1111 9 010		
1	$D \rightarrow 0$ Analyza whathar the following grammar is SLD or not Evaluin?	Domessie	CO 2	AIT004.04
4	Anaryze whether the following granniar is SLK of not. Explain?	Kemember	02	AI1004.04
	your answer with reasons.	Analysis		

	$S \rightarrow L = R$			
	$S \rightarrow R$			
	$L \rightarrow R$			
	$L \rightarrow id$			
	$R \rightarrow L_{c}$			
5	Analyze whether the following grammar is CLR or not. Explain your answer	Remember	CO 2	AIT004.05
	with reasons?	Analysis		
	$S \rightarrow AA$	T mary 515		
	$A \rightarrow aA \mid b$			
6	Prepare SLR parsing table for the below grammar?	Remember	CO 2	AIT004.05
	$F \rightarrow F+T \mid T$			
	$T \rightarrow T * F F$			
7	$\Gamma \rightarrow (L)$ [10.] The following grammar for if then also statements is proposed to remedy the	Pamambar	CO 2	AIT004.05
/	denaling also embiguity	Analysis	02	AI1004.05
	danging-else amolguity:	Analysis		
	Stmt \rightarrow II Expr then Stmt			
	if Expr then Stmt else Stmt			
	other			
	Show that how shift and reduce conflicts can be handled in ambiguous			
	grammar.			
8	Construct LALR (1) Parsing table for following grammar?	Remember	CO 2	AIT004.05
	$S \rightarrow Aa aAc Bc bBa$			
	$A \rightarrow d$			
	$B \rightarrow d$			
9	Consider the grammar	Remember	CO 2	AIT004.05
	$S \rightarrow aSbS \mid bSaSi \in$			
	a) Construct the corresponding leftmost derivation and rightmost derivation			
	for abab			
	b) Construct the corresponding parce trees for sheh and identify whether the			
	b) Construct the corresponding parse frees for abab and identify whether the			
	grammar is ambiguous or not.	D 1	~~ •	4 17700 4 0 5
10	Consider the grammar	Remember	CO 2	AI1004.05
	$S \rightarrow AS b$			
	$A \rightarrow SA \mid a$			
	Check whether the given grammar is LALR(1) or not?			
	UNIT -III			
	SYNTAX-DIRECTED TRANSLATION AND INTERMEDIATE	CODE GENE	RATION	
	Part - A (Short Answer Questions)			
1	What is the usage of syntax directed definition?	Understand	CO 3	AIT004.08
2	Define Attribute Grammar?	Understand	CO 3	AIT004.07
3	List the types of Attribute Grammar?	Understand	<u>CO 3</u>	AIT004.07
4	Write a note on syntax directed translation?	Understand	CO 3	AIT004.07
) 2	Define L attributed anonymer?	Remember	CO 3	ATT004.08
0	Define S attribute grammar?	Remambar	CO 3	ATT004.08
0	Construct the Syntax tree for Expression using functions? $(a \pm b) * (b = a)$	Remember	CO 3	AIT004.08
0 0	Explain the functions to create nodes of Syntax tree for expression?	Understand	CO 3	AIT004.08
10	Define syntax tree? Draw the syntax tree for the assignment statement?	Remember	CO 3	AIT004.08
10	a := b * -c + b * -c	Kentenibel	05	111007.00
11	Define Translation schemes?	Understand	CO 3	AIT004.07
12	Define Annotated Parse Tree?	Remember	CO 3	AIT004.07
14			203	

13	List the three kinds of intermediate representation?	Understand	CO 3	AIT004.09
14	State the benefits of using machine-independent intermediate form?	Understand	CO 3	AIT004.09
15	What is postfix notation?	Understand	CO 3	AIT004.09
16	How can you generate three-address code?	Remember	CO 3	AIT004.10
17	Translate $x+y-(a*b)+c$ into three address code?	Remember	CO 3	AIT004.10
18	Discuss back-end and front-end?	Understand	CO 3	AIT004.10
19	Define abstract or syntax tree?	Understand	CO 3	AIT004.11
20	List out types of three address code?	Understand	CO 3	AIT004.11
	Part – B (Long Answer Questions)			
1	Explain briefly about syntax directed definition and it types?	Understand	CO 3	AIT004.08
2	Explain briefly about Synthesized and Inherited attribute in detail?	Understand	CO 3	AIT004.09
3	Define translation scheme and write three address code for a b or b>c?	Remember	CO 3	AIT004.07
4	Explain briefly about S-attributed and L- attributed grammar in detail?	Remember	CO 3	AIT004.07
5	Explain how declaration is done in a procedure using syntax directed translation?	Understand	CO 3	AIT004.07
6	Explain briefly about postfix Translation Scheme?	Understand	CO 3	AIT004.08
7	Describe the method of generating syntax directed definition for control Statements?	Remember	CO 3	AIT004.08
8	Construct SDT for the simple assignment statement with example?	Understand	CO 3	AIT004.08
9	Explain the construction steps and construct the syntax tree for expression using	Remember	CO 3	AIT004.08
	functions? $(m * n + p) + (m - n + p)$?			
10	Explain briefly syntax directed translation into three address code with suitable	Remember	CO 3	AIT004.08
	example?			
11	Explain 3 address codes and mention its types. How would you implement the three address statements? Explain with suitable examples?	Remember	CO 3	AIT004.08
12	Explain with an example to generate the intermediate code for the flow of control statements?	Understand	CO 3	AIT004.09
13	Write about Quadruple and Triple with its structure?	Remember	CO 3	AIT004.09
14	Define and represent the Triple, indirect triple and quadruple for the	Remember	CO 3	AIT004.09
	assignment statement ?			
	$\mathbf{x} := \mathbf{b} + \mathbf{d} * \mathbf{b} + \mathbf{d}$			
15	Translate the arithmetic expression a* - (b+c) into	Remember	CO 3	AIT004.09
	a) A syntax tree			
	b) Postfix notation			
	c) Three-address code			
16	Translate the expression $-(a + b) * (c + d) + (a + b + c)$ into	Remember	CO 3	AIT004.09
	a) quadruples			
	b) triples			
	C) indirect triples.			
17	Explain translation scheme for Boolean Expressions with example?	Remember	CO 3	AIT004.11
18	Explain translation scheme for Control Flow with example?	Remember	CO 3	AIT004.11
	Part – C (Problem Solving and Critical Think	ing)		
1	Write production rules and semantic actions for S-attributed grammar for the	Remember	CO 3	AIT004.11
	string $a^{+}b_{-}c/d \pm e^{2}$			
	$I \rightarrow F$			
	$F \rightarrow F + T \mid F_{-}T \mid T$			
	$E \rightarrow E + 1 E^{-1} 1$ $T \rightarrow T * E T / E E$			
	$1 \rightarrow 1$ $\Gamma \mid 1/\Gamma \mid \Gamma$			
	$F \rightarrow P - F \mid P$			
	$P \rightarrow (E)$			
	$P \rightarrow ID$			
2	Write production rules and semantic actions for the following grammar	Remember	CO 3	AIT004.11
	along with annotated parse tree for the string 9-5+4?			
	$expr \rightarrow expr + term$			
	expr - term			

	term			
	$term \rightarrow 0 1 2 3 4 5 6 7 8 9$			
3	Write production rules and semantic actions for the following grammar along	Remember	CO 3	AIT004.11
	with annotated parse tree for the expression: "int a, b, c"?			
	$D \rightarrow T L$			
	$T \rightarrow int$			
	$T \rightarrow float$			
	$L \rightarrow L_{1,id}$			
	$L \rightarrow id$			
4	Write production rules and semantic actions for the following grammar along	Remember	CO 3	AIT004.11
	with annotated parse tree for the string $(3+4)^*(5+6)$?			
	L→E			
	$E \rightarrow T$			
	$E \rightarrow E_1 + T$			
	$T \rightarrow F$			
	$T \rightarrow T_1 * F$			
	$F \rightarrow (E)$			
	$F \rightarrow digit$			
5	Write production rules and semantic actions for the following grammar along	Remember	CO 3	AIT004.11
	with annotated parse tree for the string $a-4+c$?			
	$E \rightarrow E_1 + T$			
	$F \rightarrow F_1 - T$			
	E→T			
	$T \rightarrow (F)$			
06	Generate the three address code and draw the abstract tree for the following	Remember	CO 3	AIT004 09
00	expressions?	rememori	005	111001109
	a) $(x-y)*z+m-n$			
	b) $a+(b-c)+(b+c)*(a*e)$			
07	Generate the three-address code for the following C program fragment	Remember	CO 3	AIT004.09
	?while(a > b)			
	{			
	if $(c < d)$			
	$\mathbf{v} = \mathbf{v} \pm 7$			
	x - y + z,			
	X = y - Z;			
08	Construct triples Indirect and quadriples of an expression: $a = b * - c + b * - c^2$	Remember	CO 3	AIT004.09
00	Construct triples. Indirect and quadriples of an expression $x = (a + b)^* - c^{1/2}$	Remember	CO 3	AIT004.09
	Construct utples, maneet and quadriples of an expression : $x = (a + b)^* - c/d$?	-	005	
10	Why are quadruples preferred over triples in an optimizing compiler with	Remember	CO 3	AIT004.09
	example?			
	UNIT -IV			
	TYPE CHECKING AND RUN TIME ENVIRON	NMENT		
1	Part – A (Short Answer Questions)	Understand	00.4	A ITO0 4 1 4
1		Understand	(()))	ALIUU4.14
	Define Type checking?	Understand		AIT004.12
2	Define Type checking?	Understand	CO 4	AIT004.12
$\frac{2}{3}$	Define Type checking? List the different types of type checking? Define Type Expression?	Understand Understand Understand	$\begin{array}{r} \text{CO 4} \\ \text{CO 4} \\ \text{CO 4} \\ \text{CO 4} \end{array}$	AIT004.12 AIT004.12 AIT004.12

5	Write about the type systems?	Understand	CO 4	AIT004.12
6	Write a short note on static type checking?	Understand	CO 4	AIT004.12
7	Write a short note on Dynamic type checking?	Understand	CO 4	AIT004.12
8	Define Structural Equivalence?	Understand	CO 4	AIT004.12
9	What is the Strongly typed language?	Understand	CO 4	AIT004.13
10	Define Type error?	Understand	CO 4	AIT004.13
11	Write Translation scheme for checking the type of Assignment statement	Remember	CO 4	AIT004.12
	S→id:=E			
12	Write Translation scheme for checking the type of Conditional statement	Remember	CO 4	AIT004.12
	$S \rightarrow if E then S1$			
13	Write Translation scheme for checking the type of while statement	Remember	CO 4	AIT004.12
	S→While E do S1			
14	Define Type conversion?	Understand	CO 4	AIT004.12
15	List the types of type conversion?	Understand	CO 4	AIT004.12
16	Write about general activation record?	Understand	CO 4	AIT004.14
17	Define Symbol table?	Understand	CO 4	AIT004.14
18	Define Dynamic storage allocation?	Understand	CO 4	AIT004.14
19	Write short note on procedures?	Understand	CO 4	AIT004.14
20	Define Activation tree?	Understand	CO 4	AIT004.14
21	Define stack storage allocation?	Understand	CO 4	AIT004.13
22	Define static storage allocation?	Understand	CO 4	AIT004.13
23	Define heap storage allocation?	Understand	CO 4	AIT004.13
24	Write a short note on parameter passing?	Understand	CO 4	AIT004.13
25	Define Control stack?	Understand	CO 4	AIT004.13
	Part – B (Long Answer Questions)			
1	Write a note on the specification of a simple type checker/	Understand	CO 4	AIT004.12
2	Define a type expression? Explain the equivalence of type expressions with an	Understand	CO 4	AIT004.12
	appropriate example?			
3	Write about reusing the storage space for names?	Understand	CO 4	AIT004.14
4	Discuss and analyze about all allocation strategies in run-time storage	Understand	CO 4	AIT004.14
	environment?			
5	Explain the data structures used for implementing Symbol Table?	Understand	CO 4	AIT004.15
6	Explain Static and Dynamic Checking of types with examples?	Understand	CO 4	AIT004.14
7	Differentiate the call by value and call by name with examples?	Understand	CO 4	AIT004.15
8	Distinguish between static and dynamic storage allocation?	Understand	CO 4	AIT004.14
9	Explain the type checking of expressions?	Understand	CO 4	AIT004.12
10	Write a short note on storage organization in runtime environment?	Understand	CO 4	AIT004.15
11	Explain the static and dynamic storage allocations?	Understand	CO 4	AIT004.13
12	Describe the name and structure equivalence in type expressions?	Understand	CO 4	AIT004.12
13	Explain the type checking of control flow statements?	Understand	CO 4	AIT004.12
14	Explain briefly about storage allocation strategies?	Understand	CO 4	AIT004.14
15	Describe the basic implementation techniques for symbol table?	Understand	CO 4	AIT004.15
16	Explain the calling sequences of activation record?	Remember	CO 4	AIT004.14
17	Differentiate ordered, unordered and binary search tree in symbol table?	Understand	CO 4	AIT004.15
18	Explain briefly about static storage allocation with block diagram?	Understand	CO 4	AIT004.14
19	Differentiate explicit and implicit allocation of memory to variables?	Understand	CO 4	AIT004.14
20	Differentiate stack and heap storage allocation strategies?	Understand	CO 4	AIT004.14
	Part – C (Problem Solving and Critical Think	(ing)		
1	Suppose that the type of each identifier is a sub range of integers, for	Analysis	CO 4	AIT004.12
	expressions with operators +, -, *, div and mod, as in Pascal. Write type-			
	checking rules that assign to each sub expression the sub range its value must			
	lie in? Engleigheighte shout Service 1999	I Indanata d		A IT004 12
2	Explain briefly about Source language issues?	Understand	<u>CO 4</u>	AIT004.13
3	Explain oriently about Activation record with block diagram?	Understand	<u>CO 4</u>	AI1004.14
4	Discuss about varaiable length data on stack with neat diagram?	Understand	CO 4	AI1004.14

6 Explain briefly about stack storage allocation with block diagram? Understand CO 4 ATT004.14 7 Explain briefly about language facilities for dynamic storage allocation? Understand CO 4 ATT004.14 8 Describe the parameter passing methods with examples? Understand CO 4 ATT004.14 9 Explain Over loading of Operators & Functions with examples? Understand CO 4 ATT004.14 10 Differentiate the call by reference and call by copy restore with examples? Understand CO 4 ATT004.14 11 List the principle sources of optimization? Understand CO 5 ATT004.15 2 Define Coal optimization? Understand CO 5 ATT004.15 3 Define constant folding? Understand CO 5 ATT004.15 4 Define Common Sub expressions? Understand CO 5 ATT004.15 5 Define Common Sub expressions? Understand CO 5 ATT004.15 6 Explain Dead Code? Remember CO 5 ATT004.15 7 Write the techniques used for loop optimization and Reduction in strength? Remember CO 5 ATT004.16	5	Explain briefly about heap storage allocation with block diagram?	Understand	CO 4	AIT004.14	
7 Explain briefly about language facilities for dynamic storage allocation? Understand CO 4 ATT004.14 8 Describe the parameter passing methods with examples? Understand CO 4 ATT004.14 9 Explain Over loading of Operators & Functions with examples? Understand CO 4 ATT004.14 10 Differentiate the call by reference and call by copy restore with examples? Understand CO 4 ATT004.14 Variation 2000 Colspan="2">Variation 2000 Colspan="2">Variatis the colspan 2000 Colspan="2" Colspan=	6	Explain briefly about stack storage allocation with block diagram?	Understand	CO 4	AIT004.14	
8 Describe the parameter passing methods with examples? Understand CO4 AIT004.14 9 Explain Over loading of Operators & Functions with examples? Understand CO4 AIT004.14 10 Differentiate the call by reference and call by copy restore with examples? Understand CO4 AIT004.14 UNDERSTAND CODE GENERATOR Part - A (Short Answer Questions) 1 List the principle sources of optimization? Understand CO5 AIT004.15 2 Define local optimization? Understand CO5 AIT004.15 3 Define constant folding? Understand CO5 AIT004.15 5 Define constant folding? Understand CO5 AIT004.15 6 Explain Dead Code? Understand CO5 AIT004.15 7 Write the techniques used for loop optimization and Reduction in strength? Remember CO5 AIT004.15 8 Write about inner loops? Remember CO5 AIT004.16 10 Define endow graph and basic block? Understand CO5	7	Explain briefly about language facilities for dynamic storage allocation?	Understand	CO 4	AIT004.14	
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11 Discuss about the following Remember CO 5 AIT004 16	10	Explain peephole optimization in detail?	Understand	CO 5	AIT004.17	
	11	Discuss about the following	Remember	CO 5	AIT004.16	
i. Copy propagation		i. Copy propagation				
ii Dead code elimination		ii Dead code elimination				
iii Code motion		iii Code motion				
III. Code III00001 Data 12. Explain in the DAG representation of the basic block with example? Domember CO.5 AIT004.16	10	III. Cour III011011 Explain in the DAG representation of the basic block with exemple?	Remember	CO 5	ΔΙΤΩ04.16	
12 Explain in the DAG representation of the basic block with example? Remember CO 5 AIT004.10 13 Explain loop optimization in detail with example? Remember CO 5 AIT004.15	12	Explain in the DAO representation of the basic block with example?	Remember	CO 5	AIT004.10	
13 Explain loop optimization in detail with example: Remember CO 5 AIT004.15 14 Explain various Global optimization techniques in detail? Remember CO 5 AIT004.16	13	Explain loop optimization in detail with example:	Remember	CO 5	AIT004.15	
15 Explain Loops in flow graph in detail with example? Remember CO 5 AIT004.17	15	Explain Loops in flow graph in detail with example?	Remember	CO 5	AIT004.17	

16	Explain Local optimization in detail with example?	Remember	CO 5	AIT004.16
17	Discuss Redundant-instructions elimination and Flow-of-control	Understand	CO 5	AIT004.17
	optimizations?			
18	Demonstrate the simple code generator with a suitable example?	Remember	CO 5	AIT004.17
19	Write the procedure to detect induction variable and dead code elimination	Remember	CO 5	AIT004.20
	with example?			
20	Explain briefly about register allocation and assignment?	Understand	CO 5	AIT004.16
21	Explain the instruction cost in detail with example?	Understand	CO 5	AIT004.16
	Part – C (Problem Solving and Critical Think	king)		
	Show the code sequence generated by the simple code generation algorithm	Remember	CO 5	AIT004.17
1	$x^*y + (m-k) - (g+b)$			
2	Generate target code for the given program segments:	Remember	CO 5	AIT004.17
	main()			
	{			
	int i=4,j;			
	j = i + 5;			
	}			
3	Consider the following basic block of 3-address instructions .Generate target	Remember	CO 5	AIT004.16
	code for the source language statement and finds its cost.			
	a := b + c			
	$\mathbf{x} := \mathbf{a} + \mathbf{b}$			
	b := a - d			
	c := b + c			
	d := a - d			
	$\mathbf{y} := \mathbf{a} - \mathbf{d}$			
4	Identify the register descriptor target code for the source language	Remember	CO 5	AIT004.17
	Statement and its cost.			
	(a-b) + (a-c) + (a-c)			
5	Consider the following part of code.	Remember	CO 5	AIT004.16
	int main()			
	{			
	$\frac{1}{10000000000000000000000000000000000$			
	m(n, k-0)			
	10r(1=2;1 <n;1++)< td=""><td></td><td></td><td></td></n;1++)<>			
	1f(n%1),==0)break;			
	}			
	k=1;			
	if(i==n)			
	printf("number is prime");			
	else			
	printf("number is not printed");			
	}			
	Identify the basic block in the given program			
6	Construct the DAG for the following basic block.	Remember	CO 5	AIT004.16
	$D := B^{*} C$ $F := \Delta \perp B$			
	B := B + C			
	A:=E-D			
7	Design basic block for following code	Remember	CO 5	AIT004.17
	void quicksort(m, n)			
	int m, n;			

	int i. j:			
	$if(n \le m)$			
	return: /* fragment begins here */			
	i = m - 1;			
	$\mathbf{i} = \mathbf{n};$			
	$\mathbf{v} = \mathbf{a}[\mathbf{n}];$			
	while(1)			
	do			
	i = i+1;			
	while($a[i] < v$);			
	do			
	j = j-1;			
	while($a[j] > v$);			
	$if(i \ge j)$ break;			
	$\mathbf{x} = \mathbf{a}[\mathbf{i}];$			
	$\mathbf{a}[\mathbf{i}] = \mathbf{a}[\mathbf{j}];$			
	a[j] = x;			
	}			
	$\mathbf{x} = \mathbf{a}[1];$			
	a[1] = a[n];			
	a[n] = x; /* fragment ends here */			
	quicksort(m, j);			
	quicksort(1+1, n);			
8	Explain how the following expression can be converting in a DAG.	Remember	CO 5	AIT004.16
	a+b*(a+b)+c+d			
9	Explain role of DAG representation in optimization with example?	Remember	CO 5	AIT004.16
10	Deign the basic block and flow graph for the following code	Remember	CO 5	AIT004.20
	begin			
	prod :=0;			
	i:=1;			
	do begin			
	prod := prod + a[i] * b[i];			
	i :=i+1;			
	end			
	while $i \leq 20$			
	end			
11	Generate optimal machine code for the following c program.	Remember		AIT004.18
	main()			
	{			
	int i,a[10];			
	while(i<=10)			
	a[i]=0;			

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