GUJARAT TECHNOLOGICAL UNIVERSITY

BE 6 SEMESTER – OLD PAPER – W22 TO S26 – QUESTION BANK

Subject Name & Code: System Software - 3160715

Chapter 1: Overview of System Software

Repeated Questions:

1. Problem-Oriented and Procedure-Oriented Languages:

- **Q.** Differentiate Problem Oriented Languages and Procedure Oriented Languages. / Difference between Procedure oriented language and Problem oriented language. **(WINTER 2023, 4 Marks; SUMMER 2026, 4 Marks)**

2. Life Cycle of a Source Program:

- **Q.** Explain the various stages of the life cycle of a source program with a neat diagram. / Define System Software. Explain the Life Cycle of a Source Program with a neat diagram. [Diagram required – refer to the original question paper] **(WINTER 2023, 7 Marks; SUMMER 2026, 7 Marks)**

3. Types and Levels of System Software:

- **Q.** Explain different kinds of system software. / Compare user-centric view and system-centric view of system software. / Enlist levels of System Software. Explain any two in detail. **(SUMMER 2023, 3 Marks; SUMMER 2023, 4 Marks; WINTER 2023, 3 Marks)**

Other Important Questions:

1. Definitions and Terms:

- **Q.** Differentiate Compiler and Interpreter. **(WINTER 2022, 3 Marks)**
- **Q.** Define following terms: 1) Linker 2) Loader 3) Parser 4) Assembler **(WINTER 2022, 4 Marks)**
- **Q.** Define following: 1) Specification Gap 2) Language Processor 3) Language Migrator **(SUMMER 2025, 3 Marks)**
- **Q.** Define the following terms: i) System Programming ii) Logical Address Space iii) Device Driver **(WINTER 2025, 3 Marks)**

2. System Software Development and Trends:

- **Q.** Describe System Software Development with appropriate diagram. [Diagram required – refer to the original question paper] **(SUMMER 2025, 7 Marks)**
- **Q.** Discuss the various recent trends in software development. **(WINTER 2025, 4 Marks)**

Chapter 2: Overview of Language Processors

Repeated Questions:

1. Symbol Table:

- **Q.** What is a Symbol table? Explain how one can organize Symbol table using Linear Data Structure? / Explain the role of symbol table data structure in language processor and also, discuss how one can organize the symbol table using linear data structure? **(WINTER 2022, 3 Marks; SUMMER 2024, 7 Marks; WINTER 2025, 7 Marks)**

2. Language Processing:

- **Q.** Define Language Processing. List various phases of Language Processor. Explain each phase in detail. / Explain fundamental of language processing. **(SUMMER 2023, 7 Marks; SUMMER 2024, 3 Marks)**

Other Important Questions:

1. Definitions and Terms:

- **Q.** Define following terms: 1) Language Migrator 2) Execution gap 3) Token 4) Handle **(SUMMER 2024, 4 Marks)**

2. Intermediate Representation:

- **Q.** Discuss various desirable properties of an intermediate representation (IR) of a code in language processor. **(WINTER 2025, 3 Marks)**

Chapter 3: Assemblers

Repeated Questions:

1. Assembler Data Structures:

- **Q.** Describe following data structures: OPTAB, SYMTAB, LITTAB and POOLTAB. **(WINTER 2022, 4 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 7 Marks; SUMMER 2026, 7 Marks OR)**

2. One-Pass and Two-Pass Assemblers:

- **Q.** Differentiate one pass and two pass assembler. Explain how forward references are handled in two pass assembler. / Explain the tasks performed by the PASS-1 and PASS-2 assembler? / Explain the flowchart of a Single-Pass Assembler. What are its advantages and limitations compared to a Two-Pass Assembler? **(WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks OR; SUMMER 2026, 7 Marks)**

3. Assembler Directives:

- **Q.** Explain various Assembler directives with suitable example. / Explain advanced assembler directives with suitable example. / Explain the following assembler directives: i) END ii) ORIGIN **(SUMMER 2025, 7 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks)**

4. EQU Statement (Problem):

- **Q.** An assembly program contains the statement X EQU Y+25. Indicate how the EQU statement can be processed if a) Y is a back reference b) Y is a forward reference. / An assembly program contains the statement A EQU B+10... [Data truncated in source – refer to the original question paper] **(SUMMER 2023, 4 Marks; WINTER 2025, 7 Marks)**

5. Assembly Program: Pass I, Machine Code and Intermediate Code (Numerical):

- **Q.** Consider following assembly language program: (Source program provided) Show the contents of the symbol table at the end of Pass I / Create equivalent machine code / Write Intermediate code using Variant-I representation. [Diagram required – refer to the original question paper] **(SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks; SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR)**

Other Important Questions:

1. Definitions and Terms:

- **Q.** Define following terms: 1) START 2) END 3) BYTE 4) WORD **(WINTER 2022, 4 Marks)**

2. Forward References and Back-Patching:

- **Q.** Explain forward reference with suitable examples. How to solve it using back-patching? **(WINTER 2022, 7 Marks OR)**

3. Symbol Table and Literal Table:

- **Q.** Explain the role of Symbol Table and Literal Table in the assembly process. **(SUMMER 2026, 4 Marks)**

Chapter 4: Macro and Macro Processors

Repeated Questions:

1. Macro Definition, Call and Expansion:

- **Q.** What is a Macro? Explain the macro expansion process with an example. / Explain macro definition and call in detail. **(SUMMER 2023, 4 Marks OR; SUMMER 2026, 4 Marks)**
- **Q.** What is a semantic expansion? / What do you mean by lexical and semantic macro expansion? **(WINTER 2022, 3 Marks; WINTER 2025, 3 Marks)**
- **Q.** Explain nested macro call with example. **(SUMMER 2025, 4 Marks; WINTER 2025, 4 Marks)**

2. Macro Language Features (AIF, AGO, Expansion Time Loop):

- **Q.** Explain use of AIF and AGO with example. / Explain with examples - expansion time variables, expansion time Statements - AIF and AGO for macro programming. **(SUMMER 2023, 4 Marks; SUMMER 2024, 7 Marks; SUMMER 2026, 4 Marks)**
- **Q.** Explain the use of expansion time loop. / Explain the use of REPT and IRP statement in macros. **(SUMMER 2023, 3 Marks OR; WINTER 2025, 4 Marks OR)**

3. Macro Preprocessor Design and Tables:

- **Q.** Explain design of macro preprocessor. / Draw the schematic design of a macro preprocessor. **(WINTER 2022, 7 Marks OR; WINTER 2025, 3 Marks OR)**
- **Q.** Explain use and field of following tables of a macro KPDTAB, MDT, EVTAB, SSTAB. / Explain the various attributes of the following tables involved in macro preprocessor: i) MNT ii) KPDTAB iii) SSTAB iv) EVTAB. **(SUMMER 2024, 4 Marks OR; WINTER 2025, 7 Marks OR)**

4. Macros vs Subroutines:

- **Q.** Compare and contrast the properties of macros and subroutines with respect to the following: 1) Code space requirements 2) Execution speed 3) Processing required by the assembler. **(SUMMER 2023, 3 Marks; WINTER 2025, 7 Marks)**

Other Important Questions:

1. Macro Types and Comparisons:

- **Q.** List out advantages and disadvantages of macro. **(WINTER 2022, 4 Marks)**
- **Q.** Explain recursive macro with example. **(WINTER 2022, 4 Marks OR)**
- **Q.** Compare and Contrast macro preprocessor and macro assembler. **(SUMMER 2024, 3 Marks OR)**

2. One-Pass Macro Processor:

- **Q.** Draw a flowchart and explain a simple one pass macro processor. **(WINTER 2022, 7 Marks)**

3. Macro Writing Problems (Numerical):

- **Q.** Define a macro taking starting_location and N as parameters to find summation of all N numbers stored at location starting from starting_location. The result is to be stored at starting_location. **(SUMMER 2023, 7 Marks)**
- **Q.** Define a Macro taking A and B as parameters to compute A=A*B+B*B+A*B. **(SUMMER 2023, 7 Marks OR)**
- **Q.** Write a macro with parameters A, B, C and D. Calculate A * B + C * D in AREG. **(SUMMER 2025, 3 Marks)**

Chapter 5: Linkers and Loaders

Repeated Questions:

1. Overlay Structured Programs:

- **Q.** Explain linking of overlay structured program. **(SUMMER 2023, 3 Marks; SUMMER 2026, 3 Marks)**

2. Absolute Loader:

- **Q.** Explain absolute loader with suitable example. **(SUMMER 2023, 3 Marks OR; WINTER 2025, 4 Marks)**

3. Linker: Relocation and Linking:

- **Q.** How relocation is performed by linker? Explain with example. / Discuss in detail how linker resolves the external references. / Explain design of a linker by addressing issues of relocation and linking. **(SUMMER 2023, 7 Marks OR; SUMMER 2024, 4 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks OR)**

4. Self-Relocating Programs:

- **Q.** What is a self-relocating program? How does it work? / Explain characteristics of self-relocating programs. / A self-relocating program needs to find its load address before it can execute its relocating logic. Comment on how this information can be determined by the program. **(SUMMER 2024, 4 Marks OR; WINTER 2025, 4 Marks OR; SUMMER 2026, 3 Marks)**

5. Static and Dynamic Linking:

- **Q.** Compare and contrast Static and Dynamic Linking. / Draw the flow chart for the dynamic linking. / Describe the functions of a Linker. Explain the concept of Dynamic Linking with its benefits. **(SUMMER 2023, 4 Marks OR; SUMMER 2026, 4 Marks OR; SUMMER 2026, 3 Marks OR)**

Other Important Questions:

1. Types of Loaders:

- **Q.** Differentiate Absolute loader and Direct linking loader. **(WINTER 2022, 4 Marks)**
- **Q.** List out advantages of Relocating loader. **(WINTER 2022, 4 Marks OR)**
- **Q.** Explain Compile-and-Go loaders with example. **(SUMMER 2023, 4 Marks)**
- **Q.** Explain Bootstrap loader. **(SUMMER 2026, 3 Marks OR)**

2. Linker Algorithm and Object Modules:

- **Q.** Write and explain an algorithm for first pass of a linker. **(SUMMER 2023, 7 Marks)**
- **Q.** Explain various components of an object module. **(WINTER 2025, 7 Marks OR)**

3. Definitions and Terms:

- **Q.** What do you mean by non relocatable program? **(WINTER 2025, 3 Marks)**
- **Q.** Define the following terms: i) Overlay program ii) Relocating loader iii) Program relocation **(WINTER 2025, 3 Marks OR)**

Chapter 6: Scanning and Parsing

Repeated Questions:

1. LL(1) Parsing (Numerical):

- **Q.** Find First and Follow Set from following grammar... Check grammar is LL(1) or not? / Construct LL(1) Parsing table for the following grammar... / Develop an LL(1) parser table and parse following string using the parsing table. [Data truncated in source – refer to the original question paper] **(WINTER 2022, 7 Marks; WINTER 2022, 7 Marks OR; WINTER 2023, 7 Marks; SUMMER 2024, 4 Marks; SUMMER 2024, 7 Marks; SUMMER 2025, 4 Marks; SUMMER 2026, 7 Marks OR)**

2. Top-Down and Bottom-Up Parsing:

- **Q.** Compare Top-Down and Bottom-Up Parsing techniques. / Compare top-down and bottom-up parser. **(WINTER 2023, 7 Marks; SUMMER 2024, 3 Marks; SUMMER 2026, 3 Marks)**

3. Left Recursion:

- **Q.** Eliminate left recursion from the following grammar... / Apply rule to remove left recursion from following grammar... / Define Left Recursion. Remove Left Recursion from the following grammar... [Data truncated in source – refer to the original question paper] **(WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; SUMMER 2025, 3 Marks; SUMMER 2026, 3 Marks)**

4. Ambiguous Grammar:

- **Q.** Explain Ambiguous grammar with any suitable example. / Describe the ambiguity in grammar specification. / What is ambiguity in grammar? Eliminate left recursion from the following grammar: A → Aa | b **(WINTER 2022, 3 Marks OR; WINTER 2025, 3 Marks; SUMMER 2026, 3 Marks)**

5. LEX and YACC:

- **Q.** Explain the role of LEX and YACC utility. / Explain basic structure of a LEX program. **(WINTER 2025, 3 Marks OR; SUMMER 2026, 4 Marks)**

Other Important Questions:

1. Grammars and Parsing Techniques:

- **Q.** What is backtracking? **(WINTER 2022, 3 Marks OR)**
- **Q.** Explain types of grammar. **(WINTER 2022, 3 Marks)**
- **Q.** Define Simple Phrase and Handle. Using Handle and Simple Phrase trace the bottom up parsing algorithm. **(SUMMER 2023, 7 Marks)**
- **Q.** Explain Left factoring with example. **(SUMMER 2024, 3 Marks)**
- **Q.** Discuss the top down parsing without backtracking with example. **(WINTER 2025, 4 Marks OR)**
- **Q.** Define Operator precedence grammar. Convert following production rules of grammar into suitable Operator precedence grammar. **(SUMMER 2024, 7 Marks OR)**
- **Q.** Define: Parse tree, Syntax tree, DAG **(SUMMER 2026, 3 Marks OR)**

2. Finite Automata (Numerical):

- **Q.** Construct optimized DFA for following Regular Expression. (1)0(0|1)# **(SUMMER 2023, 7 Marks OR)**

3. Attributes:

- **Q.** Explain inherited and synthesized attributes in detail with example. **(SUMMER 2024, 4 Marks)**

Chapter 7: Compilers

Repeated Questions:

1. Phases of a Compiler:

- **Q.** Explain phases of Compiler with suitable example. / Explain the phases of compilation, from source code to target code, with diagram. [Diagram required – refer to the original question paper] **(WINTER 2022, 7 Marks; SUMMER 2026, 7 Marks)**

2. Code Optimization:

- **Q.** Explain any three Code Optimization Techniques. / List out various Code Optimization techniques used in Compiler. Explain any two techniques with suitable example. / Discuss various optimizing transformation techniques commonly used in compilers. / What is code optimization? Discuss any five techniques for code optimization used in compilers. **(WINTER 2022, 7 Marks; SUMMER 2024, 4 Marks; WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks OR)**

3. Intermediate Code: Quadruples and Triples:

- **Q.** Write Quadruple, Triples and Indirect Triples for expression... / Generate Quadruple, Triple, Indirect Triple for following expression: ans=a+b*c/2.0 / Demonstrate the use of triples and quadruples representation used in compiler with suitable example. [Data truncated in source – refer to the original question paper] **(WINTER 2022, 7 Marks OR; SUMMER 2024, 7 Marks; WINTER 2025, 7 Marks)**

4. Semantic, Specification and Execution Gap:

- **Q.** Define following terms: 1) Semantic Gap 2) Execution Gap. / Explain semantic gap, specification gap and execution gap. **(WINTER 2022, 4 Marks; SUMMER 2026, 3 Marks)**

Other Important Questions:

1. DAG and Optimization:

- **Q.** Explain DAG with example. **(SUMMER 2024, 3 Marks)**
- **Q.** Discuss dead code elimination method with suitable example. **(SUMMER 2023, 3 Marks)**

2. Memory Allocation and Binding:

- **Q.** Discuss parameters for Activation Records. **(SUMMER 2024, 3 Marks OR)**
- **Q.** Discuss the limitations of stack based memory allocation. **(SUMMER 2023, 3 Marks OR)**
- **Q.** Explain the terms Binding and Binding Times. **(SUMMER 2024, 3 Marks OR)**

Chapter 8: Interpreters & Debuggers

Repeated Questions:

1. Pure and Impure Interpreters:

- **Q.** Explain pure and impure interpreters. / Explain the difference between pure and impure interpreter. **(SUMMER 2024, 4 Marks OR; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks)**

2. Java Virtual Machine (JVM):

- **Q.** Explain JVM in detail. / Write a short note on the Java Virtual Machine (JVM). **(SUMMER 2023, 4 Marks; SUMMER 2026, 4 Marks OR)**

Other Important Questions:

1. Debuggers and Errors:

- **Q.** Explain classification of debuggers. **(SUMMER 2023, 4 Marks OR)**
- **Q.** List the types of errors encountered during program execution. **(SUMMER 2026, 4 Marks)**

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