

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-6 SEMESTER – OLD PAPER – S22 TO W25 – QUESTION BANK

Subject Name & Code: **SYSTEM SOFTWARE- 3160715**

Unit 1: Overview of System Software

Repeated Questions:

1. **Explain the user-centric view and system-centric view of system software.** (W25 - Q.1a, 03 marks)
Compare user-centric view and system-centric view of system software. (S24 - Q.1a, 03 marks)
Frequency: 2
2. **Discuss the various recent trends in software development.** (S22 - Q.1b, 04 marks)
Describe System Software Development with appropriate diagram. (S25 - Q.1c, 07 marks)
Frequency: 2

Other Important Questions (Newest to Oldest):

3. **Explain semantic gap, specification gap and execution gap.** (W24 - Q.1a, 03 marks)
 4. **Define following: 1) Specification Gap 2) Language Processor 3) Language Migrator.** (S25 - Q.1a, 03 marks)
 5. **Differentiate Problem Oriented Languages and Procedure Oriented Languages.** (S25 - Q.1b, 04 marks)
Difference between Procedure oriented language and Problem oriented language. (W23 - Q.1b, 04 marks)
 6. **Define system software. Give difference between system software and application software.** (W25 - Q.1a, 03 marks)
 7. **Define the following terms: i) System Programming ii) Logical Address Space iii) Device Driver.** (S22 - Q.1a, 03 marks)
 8. **Define following terms: 1)Linker 2)Loader 3)Parser 4)Assembler.** (W22 - Q.1b, 04 marks)
 9. **Define following terms: 1) Language Migrator 2) Execution gap 3) Token 4) Handle.** (S23 - Q.1b, 04 marks)
 10. **Differentiate Compiler and Interpreter.** (W22 - Q.1a, 03 marks)
 11. **Explain different kinds of system software.** (W23 - Q.1a, 03 marks)
 12. **Explain fundamental of language processing.** (S23 - Q.1a, 03 marks)
 13. **Explain lexical, syntax and semantic analysis with example.** (W25 - Q.1c, 07 marks)
 14. **Explain the various stages of the life cycle of a source program with a neat diagram.** (W23 - Q.1c, 07 marks)
 15. **Enlist levels of System Software. Explain any two in detail.** (S24 - Q.1b, 04 marks)
 16. **Define Language Processing. List various phases of Language Processor. Explain each phase in detail.** (S24 - Q.1c, 07 marks)
 17. **List various phases of Language Processor. Explain any one phase in detail.** (W24 - Q.1c, 07 marks)
 18. **Explain with examples - expansion time variables, expansion time Statements - AIF and AGO for macro programming.** (S23 - Q.1c, 07 marks)
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Unit 2: Overview of Language Processors

Repeated Questions:

1. **What is a Symbol Table?** (W22 - Q.2a, 03 marks)
Define the following terms: i) System Programming ii) Logical Address Space iii) Device Driver. (S22 - Q.1a, 03 marks) [*Symbol Table is a key data structure here*]
Frequency: 2
2. **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?** (S22 - Q.1c, 07 marks)
What is Symbol table? Explain how one can organize Symbol table using Linear Data Structure? (S23 - Q.5c, 07 marks)
Frequency: 2

Other Important Questions (Newest to Oldest):

3. **Explain the causes of Large Semantic Gap.** (S24 - Q.2a, 03 marks)
Explain in brief about causes of large semantic gap. (W25 - Q.5b, 04 marks)
4. **Define following terms: 1)Semantic Gap 2)Execution Gap.** (W22 - Q.2b, 04 marks)
5. **Find First and Follow Set from following grammar $S \rightarrow Aa|bAc|Bc|bBa$ $A \rightarrow d$ $B \rightarrow d$ Check grammar is LL(1) or not? OR Find First and Follow Set from following grammar $S \rightarrow AaAb|BbBa$ $A \rightarrow \epsilon$ $B \rightarrow \epsilon$ Check grammar is LL(1) or not?** (W22 - Q.2c, 07 marks)
6. **Apply rule to remove left recursion from following grammar. $S \rightarrow A$ $A \rightarrow Ad|Ae|aB|aC$ $B \rightarrow bBC|f$ $C \rightarrow g$** (S23 - Q.2a, 03 marks)
7. **Construct LL(1) parsing table for following grammar. $S \rightarrow iCtSeS|iCtS|a$ $C \rightarrow b$** (S23 - Q.2b, 04 marks)
8. **Eliminate left recursion from the following grammar. $S \rightarrow Aa/b$ $A \rightarrow Ac/Sd/\epsilon$** (W25 - Q.5b, 04 marks)
9. **Define Left Recursion. Remove Left Recursion from the following grammar: $A \rightarrow A x | A y | A B | c | d$ $B \rightarrow e$** (S25 - Q.2a, 03 marks)
10. **Construct LL(1) Parsing table for the following grammar: $S \rightarrow aAC | Bb$ $A \rightarrow eD$ $B \rightarrow f | g$ $C \rightarrow h | i$ $D \rightarrow bE | \epsilon$ $E \rightarrow eD | dD$** (S25 - Q.2b, 04 marks)

Unit 3: Assemblers

Repeated Questions:

1. **Explain the following assembler directives: i) END ii) ORIGIN.** (S22 - Q.2b, 04 marks)
Explain the following: 1. ORIGIN 2. EQU 3. LTORG. (W25 - Q.2a, 03 marks)
Explain various Assembler directives with suitable example. (W24 - Q.2c, 07 marks)
Frequency: 3
2. **An assembly program contains the statement A EQU B+10 Indicate how the EQU statement can be processed if i) B is a back reference ii) B is a forward reference.** (S22 - Q.2c, 07 marks)
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. (S24 - Q.2b, 04 marks)
Frequency: 2
3. **Discuss in detail the various data structures involved in PASS-I of the assembler.** (S22 - Q.2c OR, 07 marks)
Describe following data structures: OPTAB, SYMTAB, LITAB and POOLTAB. (W24 - Q.2c OR, 07 marks)
Describe following data structures: OPTAB, SYMTAB, LITAB and POOLTAB. (S23 - Q.2c, 07 marks)
Describe following data structures: OPTAB, SYMTAB, LITAB and POOLTAB. (W23 - Q.2b, 04 marks)
Frequency: 4
4. **Differentiate one pass and two pass assembler. Explain how forward references are handled in two pass assembler.** (S24 - Q.2 OR, 07 marks)
Differentiate between single pass Assembler and 2-pass Assembler. (W24 - Q.3b, 04 marks)
Compare one pass assembler and two pass assemblers. (S25 - Q.5a, 03 marks)
Frequency: 3

Other Important Questions (Newest to Oldest):

5. **Given the source program: START 200 MOVER AREG, =5 MOVEM AREG, M L1 MOVER AREG, =2 ORIGIN L1+3 LTORG NEXT ADD AREG, =1 SUB BREG, =2 BC LT, BACK LTORG BACK EQU L1 ORIGIN NEXT+5 MULT CREG, =4 STOP X DS 1 END. 1. Show the content of symbol table generated at the end of pass I. 2. Show the intermediate code generated for the program.** (W25 - Q.2c, 07 marks)
6. **Consider following assembly language program: Show (i) Contents of Symbol Table (ii) Intermediate codes using Variant-I representation. [Program given]** (W23 - Q.2c OR, 07 marks)
7. **Consider following assembly language program: (i) Write equivalent machine code (ii) Write Intermediate code using Variant-I representation. [Program given]** (S25 - Q.2c OR, 07 marks)
8. **Given the source program: START 100 A DS 3 L1 MOVER AREG,B ADD AREG,C MOVEM AREG,D D EQU A+1 L2 PRINT D ORIGIN A-1 C DC '5' ORIGIN L2+1 STOP B DC '19' END L1. a) Show the contents of the symbol table at the end of Pass I. b) Explain the significance of EQU and ORIGIN statement... c) Show the intermediate code generated...** (S24 - Q.2c, 07 marks)
9. **Explain and compare two variants of the intermediate code generated from multi pass assembler.** (S23 - Q.2c OR, 07 marks)
Compare variant I and variant II of intermediate code. (W25 - Q.2c, 07 marks)
10. **Draw a flowchart of maintaining Table of Incomplete Instruction (TII) in assembler.** (W23 - Q.3a, 03 marks)
11. **Explain analysis phase of an assembler.** (S25 - Q.5a, 03 marks)
12. **Explain the various tasks performed during analysis and synthesis phases of the assembler.** (W24 - Q.1b, 04 marks)

13. **Explain advanced assembler directives with suitable example.** (W23 - Q.3c, 07 marks)
Explain advanced assembler directives with suitable example. (S25 - Q.2c, 07 marks)
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Unit 4: Macro and Macro Processors

Repeated Questions:

1. Compare and contrast the properties of macros and subroutines with respect to the following: i) code space requirements ii) execution speed iii) processing required by the assembler. (S22 - Q.3c, 07 marks)

Compare and contrast the properties of macros and subroutines with respect to following: 1. Code space requirements 2. Execution speed. (S24 - Q.3a, 03 marks)

Compare and contrast the properties of macros and subroutines with respect to following criterion. 1. Code space requirement 2. Execution speed 3. Processing requirement by assembler 4. Flexibility. (W25 - Q.3a, 03 marks)

Compare features of subroutine and macro. (S25 - Q.3a, 03 marks)

Frequency: 4

2. Explain nested macro call with example. (S22 - Q.3b, 04 marks)

Explain nested macro call with example. (S25 - Q.3b, 04 marks)

Frequency: 2

3. Explain the use of AIF and AGO with example. (S24 - Q.3b, 04 marks)

Demonstrate the use of AIF and AGO. (W25 - Q.3a OR, 03 marks)

Explain expansion time statements AIF, AGO and ANOP. (S25 - Q.3c, 07 marks)

Frequency: 3

4. Explain the various attributes of the following tables involved in macro preprocessor: i) MNT ii) KPDTAB iii) SSTAB iv) EVTAB. (S22 - Q.3c, 07 marks)

Explain use and field of following tables of a macro KPDTAB, MDT, EVTAB, SSTAB. (S23 - Q.3b, 04 marks)

List and explain all the tables used in macro preprocessor. (W25 - Q.3c, 07 marks)

Frequency: 3

5. What do you mean by lexical and semantic macro expansion? (S22 - Q.3a, 03 marks)

Explain lexical and semantic expansion of macro with example. (W23 - Q.3c OR, 07 marks)

Frequency: 2

Other Important Questions (Newest to Oldest):

6. What is a macro? (W22 - Q.3a OR, 03 marks)

Define macro in the context of programming language. Explain the structure of a macro definition. (W24 - Q.4c, 07 marks)

7. List out advantages and disadvantages of macro. (W22 - Q.3b, 04 marks)

8. Draw a flowchart and explain a simple one pass macro processor. (W22 - Q.3c, 07 marks)

Explain design of macro preprocessor. (W22 - Q.3c OR, 07 marks)

9. What is a semantic expansion? (W22 - Q.3a, 03 marks)

10. Explain recursive macro with example. (W22 - Q.3b OR, 04 marks)

11. Draw the schematic design of a macro preprocessor. (S22 - Q.3a OR, 03 marks)

12. Explain the use of REPT and IRP statement in macros. (S22 - Q.3b OR, 04 marks)

Explain REPT and IRP statement with proper example. (W23 - Q.3b, 04 marks)

13. 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. (S24 - Q.3c, 07 marks)

Define a Macro taking A and B as parameters to compute $A=A*B+B*B+A*B$. (S24 - Q.3c OR, 07 marks)

14. Explain the use of expansion time loop. (S24 - Q.3a OR, 03 marks)

15. Explain macro definition and call in detail. (S24 - Q.3b OR, 04 marks)

16. Compare and Contrast macro preprocessor and macro assembler. (S23 - Q.3a, 03 marks)

17. Write a macro with parameters A, B, C and D. Calculate $A * B + C * D$ in AREG. (S25 - Q.3a, 03 marks)

18. Explain positional parameter, keyword parameter and default value parameter. (S25 - Q.3b, 04 marks)

19. **What is the difference between Keyword parameters and positional parameters?** (W23 - Q.3b, 04 marks)
Show the difference between positional parameter and keyword parameter in macro. (W25 - Q.2b, 04 marks)
 20. **What is a macro preprocessor?** (W22 - Q.4a, 03 marks)
Explain macro preprocessor in brief. (W24 - Q.4b, 04 marks)
 21. **List and explain all the task involved in macro expansion.** (W25 - Q.3c OR, 07 marks)
 22. **Write and explain the algorithm for macro expansion.** (W23 - Q.4b OR, 04 marks)
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Unit 5: Linkers and Loaders

Repeated Questions:

1. **Explain absolute loader with suitable example.** (S22 - Q.4b, 04 marks)
Explain absolute loader with suitable example. (W23 - Q.4a OR, 03 marks)
Explain in brief design of an absolute Loader. (W23 - Q.4b, 04 marks)
Describe Absolute loader in brief. (W24 - Q.3b, 04 marks)
Frequency: 4
2. **Explain the following terms: i) Overlay program ii) Relocating loader iii) Program relocation.** (S22 - Q.4a OR, 03 marks)
What is overlay? Explain the linking of overlay structured program performed. (W25 - Q.4c, 07 marks)
Explain linking of overlay structured program. (S24 - Q.4a, 03 marks)
What is Overlay? Explain the execution of an overlay structured program. (S25 - Q.4c, 07 marks)
Frequency: 4
3. **Define the following terms: 1)Linker 2)Loader 3)Parser 4)Assembler.** (W22 - Q.1b, 04 marks)
Differentiate between linker and loader. (W25 - Q.4a OR, 03 marks)
Compare loader and linker. (S25 - Q.4a, 03 marks)
Frequency: 3
4. **Explain self-relocating program.** (S25 - Q.4c, 07 marks)
Explain in brief about self relocating program. (W25 - Q.3b OR, 04 marks)
Explain characteristics of self-relocating programs. (S23 - Q.3b, 04 marks)
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. (S22 - Q.4b OR, 04 marks)
Frequency: 4
5. **Explain compile-and-go loaders.** (W25 - Q.4a, 03 marks)
Explain Compile-and-Go loaders with example. (S24 - Q.4b, 04 marks)
Explain Compile-and-Go loader. (S25 - Q.4a OR, 03 marks)
Frequency: 3
6. **Write and explain an algorithm for first pass of a linker.** (S24 - Q.4c, 07 marks)
Write and explain an algorithm for first pass of the Linker program. (W25 - Q.4c OR, 07 marks)
Frequency: 2

Other Important Questions (Newest to Oldest):

7. **What is program relocation? How relocation is performed by linker? Explain with example.** (W23 - Q.4c OR, 07 marks)
What is program relocation? How it is performed? (W25 - Q.3b, 04 marks)
8. **With algorithm and example, explain how relocation is performed by linker?** (S24 - Q.4c OR, 07 marks)
9. **Explain design of a linker by addressing issues of relocation and linking.** (S23 - Q.4b, 04 marks)
Explain how relocation and linking is performed. (W24 - Q.3c, 07 marks)
10. **What do you mean by non relocatable program?** (S22 - Q.4a, 03 marks)
11. **Discuss in detail how linker resolves the external references.** (S22 - Q.4c, 07 marks)
12. **Explain various components of an object module.** (S22 - Q.4c OR, 07 marks)
13. **Draw the flow chart for the dynamic linking.** (S24 - Q.4b OR, 04 marks)
14. **Consider an object module with three programs A, B and C, located at following addresses: Program Address A 200-250 B 302-370 C 480-533 The load address is 300 for the executable A, B and C to be generated. Find: i) Size of each Program ii) Load origin of each program iii) Relocation Factor for each Program.** (S25 - Q.4b OR, 04 marks)
15. **Explain Bootstrap loader.** (W23 - Q.5a OR, 03 marks)

- Explain Bootstrap loader.** (S25 - Q.4b, 04 marks)
16. Enlist different loading schemes. (W24 - Q.3a, 03 marks)
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Unit 6: Scanning and Parsing

Repeated Questions:

1. **Explain ambiguous grammar with any suitable example.** (W22 - Q.5a OR, 03 marks)
Describe ambiguous grammar with suitable example. (W24 - Q.2a, 03 marks)
Explain Ambiguous Grammar. (W25 - Q.5a, 03 marks)
Frequency: 3
2. **Explain the ambiguity in grammar specification.** (S22 - Q.5a, 03 marks)
Frequency: 1 (but a core topic)
3. **Construct LL(1) parsing table for following grammar. $S \rightarrow iCtSeS \mid iCtS \mid aC \rightarrow b$** (S23 - Q.2b, 04 marks)
Construct LL(1) parsing table for following grammar. $S \rightarrow iCtSeS \mid iCtS \mid aC \rightarrow b$ (W24 - Q.3b OR, 04 marks)
Frequency: 2
4. **Explain top down parsing without backtracking with example.** (S22 - Q.5b OR, 04 marks)
Discuss the top down parsing without backtracking with example. (S22 - Q.5b OR, 04 marks) *[Exact match in source]*
Explain recursive descent parsing algorithm with example. (W24 - Q.3c OR, 07 marks)
Explain recursive descent parsing algorithm. (W25 - Q.5c OR, 07 marks)
Frequency: 4
5. **Compare top-down and bottom-up parser.** (S23 - Q.3a, 03 marks)
Compare Top Down and Bottom Up Parsing. (W23 - Q.2c, 07 marks)
Frequency: 2

Other Important Questions (Newest to Oldest):

6. **Explain the role of LEX and YACC utility.** (S22 - Q.5a OR, 03 marks)
7. **Demonstrate the use of triples and quadruples representation used in compiler with suitable example.** (S22 - Q.5c, 07 marks)
8. **Explain Left factoring with example.** (S23 - Q.5a, 03 marks)
9. **Define Simple Phrase and Handle. Using Handle and Simple Phrase trace the bottom up parsing algorithm. Grammar is : $E \rightarrow T+E \mid T-E \mid T$ $T \rightarrow TV \mid T/V \mid V$ $V \rightarrow a \mid b \mid c \mid d$ String is : $a - bc + d$** (S24 - Q.5c, 07 marks)
10. **Explain handle pruning with respect to the bottom up parsing.** (W24 - Q.4a, 03 marks)
11. **Given a grammar, $E \rightarrow TA$, $A \rightarrow +TA \mid \epsilon$ $T \rightarrow VB$ $B \rightarrow *VB \mid \epsilon$ $V \rightarrow id \mid (E)$ Develop an LL (1) parser table and parse following string using the parsing table. $id * (id + id)$** (S23 - Q.4c, 07 marks)
12. **Define Operator precedence grammar. Convert following production rules of grammar into suitable Operator precedence grammar. $E \rightarrow EAE \mid id$ $A \rightarrow - \mid *$** (S23 - Q.3c, 07 marks)
13. **Define: Parse tree, Syntax tree, DAG** (W24 - Q.3a, 03 marks)
Explain DAG with example. (S23 - Q.4a, 03 marks)
14. **Define: Token, Lexeme and Pattern** (W24 - Q.3a OR, 03 marks)
15. **Obtain minimized DFA for the following regular expression: $aabc\#$** (W24 - Q.3c OR, 07 marks)
Construct optimized DFA for following Regular Expression. $(1)0(0 \mid 1)\#$ (S24 - Q.5c OR, 07 marks)
16. **Write regular expressions of a given language. The language consists no. of zero should be multiple of 3.** (W23 - Q.4a, 03 marks)
Write a regular expression for a language containing both 11 and 00 as substring. (W23 - Q.4a OR, 03 marks)
17. **Define the following. 1. Finite state automaton 2. Regular expression 3. Operator grammar** (W25 - Q.5a OR, 03 marks)

Unit 7: Compilers

Repeated Questions:

1. **Explain pure and impure interpreter.** (S22 - Q.5b, 04 marks)
Explain pure and impure interpreters. (W22 - Q.5b OR, 04 marks)
Differentiate pure and impure interpreter. (W25 - Q.4b OR, 04 marks)
Explain pure and impure interpreters. (S25 - Q.5c, 07 marks)
Explain pure & impure interpreters. (W23 - Q.5c, 07 marks)
Frequency: 5
2. **Discuss various optimizing transformation techniques commonly used in compilers.** (S22 - Q.5c OR, 07 marks)
What is optimizing transformation? discuss various optimizing transformations. (W25 - Q.5c, 07 marks)
Frequency: 2
3. **Explain the causes of Large Semantic Gap.** (S24 - Q.2a, 03 marks)
Explain in brief about causes of large semantic gap. (W25 - Q.5b, 04 marks)
Frequency: 2

Other Important Questions (Newest to Oldest):

4. **List out various Code Optimization techniques used in Compiler. Explain any two techniques with suitable example.** (S23 - Q.5b, 04 marks)
Explain any three Code Optimization Techniques. (W22 - Q.5c, 07 marks)
5. **Explain the terms Binding and Binding Times.** (S23 - Q.5a OR, 03 marks)
Describe static binding and dynamic binding. (S25 - Q.5b, 04 marks)
6. **Explain inherited and synthesized attributes in detail with example.** (S23 - Q.3b, 04 marks)
7. **Discuss dead code elimination method with suitable example.** (S24 - Q.5a, 03 marks)
8. **Explain JVM in detail.** (S24 - Q.5b, 04 marks)
Describe JVM with appropriate diagram. (S25 - Q.5c, 07 marks)
9. **Generate Quadruple, Triple, Indirect Triple for following expression:**
 $ans = a + b * c / 2.0$ (S23 - Q.5c, 07 marks)
Write Quadruple, Triples and Indirect Triples for expression, $x = -a * b + -a * b$ (W22 - Q.5c OR, 07 marks)
Write quadruple representation for the following expression: $Result = -wx + -yz$ (S25 - Q.5b, 04 marks)
(1) Write three address codes for the expression. (2) Give triple implementation for the three-address code of the expression. $x = -ab + -ab$ (W23 - Q.5b OR, 04 marks)
10. **Discuss the limitations of stack based memory allocation.** (S24 - Q.5a OR, 03 marks)
Explain memory allocation in block structured language. (W23 - Q.3a OR, 03 marks)
Discuss parameters for Activation Records (S23 - Q.3a, 03 marks)
11. **Explain the front end of toy compiler with suitable example.** (W23 - Q.5b, 04 marks)
12. **Explain phases of Compiler with suitable example.** (W22 - Q.1c, 07 marks)

Unit 8: Interpreters & Debuggers

Repeated Questions:

1. **Explain classification of debuggers.** (S24 - Q.5b OR, 04 marks)
Describe the classification of Debuggers. (W24 - Q.3b OR, 04 marks)
Frequency: 2
2. **What is debugger? Explain different types of error in program.** (W25 - Q.4b, 04 marks)
Frequency: 1

Other Important Questions (Newest to Oldest):

3. **Define: Interpreter, Explain the merits and demerits of interpretation** (W24 - Q.3c OR, 07 marks)
What is interpreter? Explain benefits of interpreter. Compare interpreter and compiler. (W23 - Q.5c OR, 07 marks)
What is interpreter? Explain pure & impure interpreters. (W23 - Q.5c, 07 marks)
4. **Enlist the languages using interpreter.** (W24 - Q.3a OR, 03 marks)
5. **Define: Subroutine, DEFTAB, ARG TAB** (W24 - Q.4a OR, 03 marks)
6. **Explain basic structure of a LEX program.** (W24 - Q.4b OR, 04 marks)
