

PTI - 20112/2018  
THURSDAY

Total No. of questions : 7]

Roll No. BETI1CS16002]

B.Tech.(CSE/CSE(Int.)), Fifth Semester  
End-Term Examination, December, 2018

## ADVANCED COMPUTER ARCHITECTURE (CSL0514)

Time : 3:00 hours

Max. Marks : 40

Note: Attempt all the questions.

### 1. Very Short Answer Type Questions.

- (i) What do you understand by the performance of the pipeline, what are the measures used for measuring the program?  $1 \times 5 = 5$
- (ii) Explain the concept of branch or Jump instruction handling.
- (iii) Distinguish between the central queue and central manager algorithm for load balancing?
- (iv) Discuss memory capacity planning?
- (v) What is node degree and network diameter?

2. (i) Explain the architectural operations of SIMD and MIMD computers. How dependencies between instructions can occur?  $2$
- (ii) Why scheduling of instructions at run time is required. Explain the concept of tomasulo's algorithm for dynamic scheduling of instructions with detailed architecture?  $3$

OR

A benchmark program is run on a 40 MHz processor. The executed program consists of 100,000 instructions executions, with the following instruction mix and clock cycle count:  $5$

Instruction type	Instruction count	Clock cycle count
Integer arithmetic	45,000	1
Data transfer	32,000	2
Floating point	15,000	2
Control transfer	8000	2

P.T.O.

Determine the effective CPI, MIPS rate, and execution time for this program?

- 3.(i) Which technique can be utilized to discover and exploit the parallelism in loops. explain with example? 2  
(ii) Differentiate super scalar and VLIW architecture in terms of hardware and software requirements? 3

**OR**

Explain internal data forwarding and possible hazards between read and write operation with respect to mechanism for instruction pipeline also Discuss superscalar pipeline structure? 5

- 4.(i) What kind of issues may arise in the processing of programs by multiprocessors that share a common operating system? 2  
(ii) Explain all three important properties satisfied by the Information stored in a memory hierarchy with diagram? 3

**OR**

Explain load balancing in terms of multiprocessing system also discuss the difference between static and dynamic load balancing? 5

5. Explain the following terms associated with cache design:  
(i) Snoopy versus directory based cache coherence protocol.  
(ii) Factors affecting cache hit ratios.  
(iii) Physical versus virtual address cache? 5

**OR**

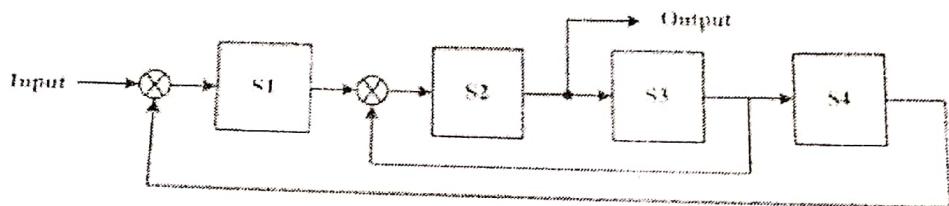
Explain the inclusion property and memory Coherence requirements in a multilevel memory hierarchy. Distinguish between write through and write back policies in maintaining the coherence in adjacent levels. Also explain the paging and segmentation in managing the physical and virtual memory hierarchy.

- 6.(i) Differentiate the routing between omega and butterfly network in multistage combining networks with the help of diagram. 5

**OR**

Explain interconnection structures in a generalized multiprocessor system with local memory, private caches and shared memory and shared peripherals? Also discuss Hierarchical Bus systems at board, backplane and I/O level?

7. Consider the following pipelined processor with four stages. This pipeline has a total evaluation time of six clock cycles. All successor stages must be used after each clock cycle. 10



- (i) Specify the reservation table for this pipeline with six columns and four rows.
- (ii) List the set of forbidden latencies between task initiations.
- (iii) Draw the state diagram which shows all possible latency cycles.
- (iv) List all greedy cycles from the state diagram.
- (v) What is the value of minimal average latency and maximal throughput of this pipeline?

OR

- Consider the following reservation table for a four stage pipeline :

	1	2	3	4	5	6
S1	X					X
S2		X		X		
S3			X			
S4				X	X	

- (i) What are the forbidden latencies?
- (ii) Draw the state transition diagram.
- (iii) List all the simple cycle and greedy cycle.
- (iv) Determine the throughput of this pipeline.
- (v) Determine the MAL (minimal average latency).

27-12-2018  
Monday

Total No. of questions : 7]

Roll No. BETIICS16002.....]

B.Tech.(CS/CS(Int.)), Fifth Semester  
End-Term Examination, December, 2018

## DATA COMMUNICATION AND COMPUTER NETWORKS (CSL0560)

Time : 3:00 hours

Max. Marks : 40

**Note:** Attempt all the questions.

**1. Very Short Answer Type Questions.**

$1 \times 5 = 5$

- (i) Can we create logs for ftp authenticated sessions ?
- (ii) In Pulse Code Modulation (PCM), what is quantization ?
- (iii) What is relation between bit rate and baud rate ?
- (iv) Is the relationship between vpn and firewalls?
- (v) Describe the different roles of http?

**2. Compare and contrast CSMA/CD with CSMA/CA. Explain CSMA/CD.  
What are its advantages and disadvantage? 5**

**OR**

- (i) Explain stop and wait protocol. 3
- (ii) What is CRC ? For  $p=110011$  and M  $11100011$ . find CRC. 2

**3. Name the four basic network topologies, and cite an advantage of each type. 5**

**OR**

- (i) What is difference between half-duplex and full-duplex transmission modes with suitable example? 3
- (ii) What is the difference between a port address, a logical address, and a physical address? 2

P.T.O.

- 4.(i) List RIP shortcomings and their corresponding fixes. What are the functions of a RIP message? 3  
(ii) Why do OSPF messages propagate faster than RIP messages? 2

**OR**

Give an argument why the leaky bucket algorithm should allow just one packet per tick, independent of how large the packet is. 5

- 5.(i) Do port addresses need to be unique? Why or why not? Why are port addresses shorter than IP addresses? 3  
(ii) Compare the TCP header and the UDP header. List the fields in the TCP header that are missing from UDP header. Give the reason for their absence. 2

**OR**

Explain OSI-ISO model with function of its layers. 5

- 6.(i) Explain the architecture of WWW. Also define client, server, URL. 3  
(ii) Write the major function of presentation layer. Why it removes from TCP/IP? 2

**OR**

Explain why the client issues an active open for the control connection and a passive open for the data connection. 5

7. If the address of S1 is 210.116.112.37 and IP address of S2 is 210.116.112.48 and IP address of S3 210.116.112.86 and IP address of S4 is 210.116.112.113 if IP address of S5 210.116.112.131 and subnet mask is 255.255.255.240. identify which of the system belong to same subnet ID. 10

**OR**

Explain the procedure for checksum calculation and verification in the IPv4 protocol. What part of an IPv4 packet is covered in the checksum calculation? Why? Are options, if present, included in the calculation? Compare and contrast the fields in the main headers of IPv4 and IPv6. Make a table that shows the presence or absence of each field.

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17-13/12/2018  
THURSDAY

Total No. of questions : 7]

Roll No. BETI/CS/6002]

B.Tech.(CS/CS(Int.)/CS(Hons.)), Fifth Semester  
End-Term Examination, December, 2018

## THEORY OF COMPUTATION (CSL0516)

Time : 3:00 hours

Max. Marks : 40

Note: Attempt all the questions.

### 1. Very Short Answer Type Questions.

$1 \times 5 = 5$

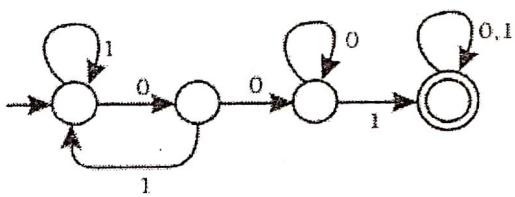
- (i) The numbers of steps require generating a string of length  $|w|$  in Chomsky normal form is?
- (ii) The intersection of context free language and regular language is?
- (iii) Grammar that produces more than one Parse tree for same sentence is?
- (iv) Define push down automata (PDA).
- (v) Write down any two identities/properties of regular expression.

- 2(i) Construct a DFA which accepts set of all strings over  $\{a, b\}$  in which number of a's are divisible by 3 and number of b's are divisible of 2.3
- (ii) Construct an NFA for set of all strings of length atleast '2' over  $\{a,b\}$ .2

OR

Consider the following deterministic finite state automaton M.

5



Let S denote the set of seven bit binary strings in which the first, the fourth, and the last bits are 1. What are the maximum possible strings in S that are accepted by M? Explain.

P.T.O.

~~3.(i)~~ Let G be the grammar.

3

$S \rightarrow 0B|1A$ ,  $A \rightarrow 0|0S|1AA$ ,  $B \rightarrow 1|1S|0BB$ . For the string 00110101.

**Find:**



(ii) Consider a context free grammar G with the following productions:

$S \rightarrow aSh$

$$S \rightarrow ab$$

Give the language L generated by this grammar G.

?

OR

- (i) Design a PDA which accepts the language  $L = \{a^n b^n \mid n \geq 1\}$ . 3

(ii) Explain closure properties of CFL's. 2

4. Determine the DFA for the given NFA transition table. 5

Present State	Next State	
	a	b
$\rightarrow q_0$	$q_0, q_1$	$q_0$
$q_1$	$q_2$	$q_2$
$q_2$	-	-

OR

How many types of grammar are there? Explain each of them.

5. Consider the following grammar:

5

$S \rightarrow A | 0C1$

$$A \rightarrow B|01|10$$

$$C \rightarrow \varepsilon | CD$$

- (i) Eliminate the NULL ( $\epsilon$ ) productions.
  - (ii) Eliminate UNIT productions (iii) Eliminate Useless symbols.

QR

- (i) Design a Turing machine which can add two positive integers. 3  
(ii) Write down the difference between DFA and NFA. 2

6. Find a grammar in Chomsky normal form equivalent to: 5

$$S \rightarrow aAbB$$

$$A \rightarrow aA \mid a$$

$$B \rightarrow bB \mid b$$

**OR**

Construct a grammar in Greibach normal form equivalent to the grammar

$$S \rightarrow AA \mid a, A \rightarrow SS \mid b.$$

7. Let  $M$  be a Turing machine that has 5 states,  $q_0$  to  $q_4$  where  $q_0$  is the initial state and  $q_4$  is the final state. The symbol B is the blank symbol used to indicate end of an input string. The transition function of  $M$  is described in the following table.

The entry  $(q_1, X, R)$  in row  $q_0$  and column 0 signifies that if  $M$  is in state  $q_0$  and reads 0 on the current tape, then it writes  $X$  on the same tape and moves its tape head one position to the right and transitions to state  $q_1$ . Find whether the given string are accepted or rejected. 10

- (i) 0011            (ii) 0100            (iii) 101

**OR**

Construct the finite automata as well as write regular expressions for the following statements:

- (i) A language over  $\{0, 1\}$  that has either two 1 or three 1 such that first two 1's are not consecutive.  
(ii) A language that begin with 0 and ended by 1 over  $\{0, 1\}$ .  
(iii) A language that accepts the set of all string over  $\{0, 1\}$  containing atleast two 1.  
(iv) A language that accepts the set of strings over  $\{0, 1\}$  that ended by 11.

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T Total No. of questions : 7/

Roll No. BETI/CS/6002/

B.Tech.(CS/CS(Int.)/CS(Hons.)), Fifth Semester (Regular & Ex Category)  
End-Term Examination, December, 2018

## DESIGN AND ANALYSIS OF ALGORITHMS/ANALYSIS AND DESIGN OF ALGORITHMS (CSL0559/CSL0509)

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N

Time : 3:00 hours

Max. Marks : 40

Note: Attempt all the questions.

### 1. Very Short Answer Type Questions.

1 × 5=5

(i) Find the time complexity of the given function:

```
Func()  
{  
    int i, j, k;  
    for (i=n/2 ; i<= n; i++)  
        for (j=1; j<=n; j= 2* j)  
            for(k=1; k<=n; k=k*2)  
                cout<< "DAA";  
}
```

(ii) Do 5-queen problem has a solution?

(iii) An unordered list contains n distinct elements. The minimum number of comparisons to find an element in this list i.e. neither maximum nor minimum is of the order of .....

(iv) Find the complexity of given recurrence:

$$T(n) = 2T(n/4) + n^2 \sqrt{n}$$

(v) Write the recurrence relation of Quick sort.

2. (i) Discuss the criteria for analysis of algorithms and explain the importance of asymptotic order in analysis. 3

P.T.O.

- (ii) Give a proof which shows that the recurrence relation  $T(n) = mT(n/2) + an^2$  is satisfied by  $T(n) = O(n \log m)$ . 2

**OR**

- (i)  $T(n) = 2T(n/2) + n$ ;  $n > 1$  (using recursion tree method) 3  
= 1 ;  $n=1$
- (ii) Describe and write a procedure which can perform  $n-1$  passes in bubble sort is  $O(n^2)$  2

- 3.(i) Explain the divide and conquer strategy giving its control abstraction. What is the recurrence relation if the problem is equally subdivided? 3  
(ii) Write recurrence relations for following algorithms and solve it by Master's theorem:  
Matrix Multiplication ( $N \times N$  dimensions)  
Binary Search Tree 2

**OR**

- (i) How does Strassen's matrix multiplication achieve improvement over conventional divide and conquer technique of matrix multiplication? Also determine time complexity of Strassen's matrix multiplication. 3  
(ii) Find an optimal solution to the fractional knapsack instance  $n=6$ , maximum weight capacity = 16. 2

ITEM	WEIGHT	VALUE
i1	6	6
i2	10	2
i3	3	1
i4	5	8
i5	1	3
i6	3	5

4. Discuss Branch and Bound approach to solve Travelling Salesman Problem

- 3 -

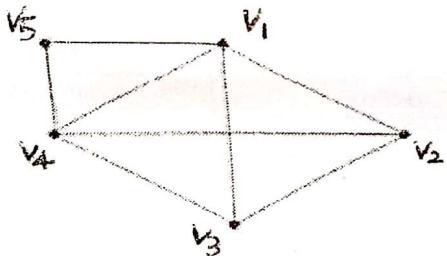
and obtain optimal solution for following cost matrix:

5

$\infty$	8	5	4
8	$\infty$	6	3
5	6	$\infty$	2
4	3	2	$\infty$

OR

- (i) Suppose two queens are placed at positions  $(i, j)$  and  $(k, l)$  then write the conditions for each of the following: 3
- No two queens lie in same row
  - No two queens lie in same column
  - No two queens lie in same diagonal
- (ii) Draw state-space diagram to obtain Hamiltonian Circuit for the following graph. 2



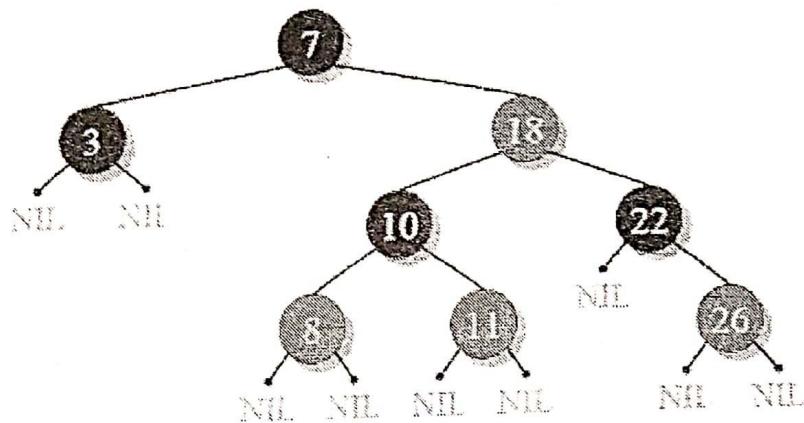
- (v) A red-black tree is a kind of self-balancing binary search tree in computer science. Each node of the binary tree has an extra bit, and that bit is often interpreted as the color of the node. These color bits are used to ensure the tree remains approximately balanced during insertions. Insert a node in given red-black tree and balance it. Insert New Node 2, 6, 1 and 13 in below tree.

In this tree node 3, 7, 10, 22 is Black Color and node 8, 11, 18, 26 is Red

P.T.O.

Color and NIL is Black Color.

5



OR

- (i) Solve the 8 puzzle problem using Branch and Bound where initial and goal configuration is given below. 3

Initial configuration				Goal configuration		
1	2	3		1	2	3
5	6			5	8	6
7	8	4			7	4

- (ii) Describe and write a procedure which can perform  $n-1$  union operations on disjoint sets in  $O(n \log n)$  time. 2

6 Define the following term related to NP-Completeness- 5

- (i) P Class
- (ii) NP Class
- (iii) NP-Complete Class
- (iv) NP-Hard Class

OR

What are NP-complete problem? How are they different from NP-hard problem? 3

Define P and NP. Also prove that  $P \subseteq NP$ . 2

Huffman codes compress data very effectively: savings of 20% to 90%

are typical, depending on the characteristics of the data being compressed. We consider the data to be a sequence of characters. Huffman's greedy algorithm uses a table giving how often each character occurs (i.e., its frequency) to build up an optimal way of representing each character as a binary string. Suppose we have a 100,000-character data file that we wish to store compactly. That is, only 6 different characters appear, and the character *a* occurs 45,000 times. A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency:

Character	A	B	C	D	E	F
Frequency	45	13	12	16	9	5

Each character in input message takes 1K byte. If the compression technique used is Huffman Coding, how many bits will be saved in the message? **10**

**OR**

*Longest Common Subsequence.* (This is a classical dynamic programming problem.) Given a sequence of real numbers  $A_1; A_2; \dots; A_n$ , determine a subsequence (not necessarily contiguous) of maximum length in which the values form a strictly increasing sequence. String *s* is a subsequence of string *a* if *s* can be obtained from *a* by detecting some of the characters in *a*. The string 'onion' is a subsequence of 'recognition'. *s* is a common subsequence of *a* and *b* iff it is a subsequence of both *a* and *b*. The length of *s* is its number of characters. Develop a dynamic-programming-algorithm to find a longest common subsequence of the strings *a* and *b*.

Date:-06/12/18  
Thursday

Total No. of questions : 7]

Roll No. B.E.T.I.C.S16002..]

B.Tech.(CS/CS(Int.)/CS(Hons.)), Fifth Semester  
End-Term Examination, December, 2018

## **SOFTWARE ENGINEERING (CSL0508)**

Time : 3:00 hours

Max. Marks : 40

**Note:** Attempt all the questions.

**1. Very short Answer Type Questions.  $1 \times 5 = 5$**

- (i) How is a software project planned? Briefly explain.
- (ii) Explain different software quality parameters.
- (iii) What do you understand by the reliability of software?
- (iv) What is a pseudo code?
- (v) Distinguish between loosely-coupled and tightly-coupled systems.

**2. What do you understand by a software life cycle model? What problems might occur if a software development organization does not use any specific life cycle model? 5**

**OR**

Why documentation is important? What are the different precautions should keep in mind while documenting a software product for a company?

**3. What do you understand by the term 'top-down decomposition' in the context of function-oriented design? 5**

**OR**

Distinguish between top-down and bottom-up integration testing. Which one of these types of integration testing requires stubs and which requires drivers? Explain your answer.

**P.T.O.**

4. What are the difference between black-box and white-box testing? Can one be used in place of another? 5

**OR**

What is Cyclomatic Complexity? How is it computed? Illustrate the computation procedure with a suitable example. How is Cyclomatic Complexity effected, if one of the 'for' loops is replaced by a 'while' loop? Explain.

5. In a waterfall model-based software development project, identify five reasons as to why the customer requirements may change after the requirements phase is complete and the SRS document has been signed off. 5

**OR**

Give an example of a software development project for which the iterative Waterfall mode is not suitable. Briefly justify your answer.

6. Suppose you are the project manager of a small team developing a business application. Assume that your team has experience in developing several similar products. If you are asked to make a choice between Software Engineer and Software Tester, which one would you adopt for your team? Explain the reason of your answer. 5

**OR**

What is the difference between requirements analysis and requirements specification? Using suitable examples, explain different types of requirement problems that should be identified and resolved during the requirements analysis activity?

7. Define the following in brief in context of software quality: (i) Integrity  
(ii) usability (iii) maintainability (iv) testability (v) portability (vi) reusability  
(vii) interoperability (viii) consistency (ix) execution efficiency  
(x) expandability? 10

*OR*

Draw a labeled DFD model for Student Academic Management (SAM) software that should support the following features:

- (a) Register students to subjects
  - (b) Award marks for subjects
  - (c) Query marks
  - (d) Print report cards
  - (e) Compute statistics of student performance
-