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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

III Semester B. E. Examinations Nov/Dec-17

Computer Science and Engineering

DATA STRUCTURES USING C

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

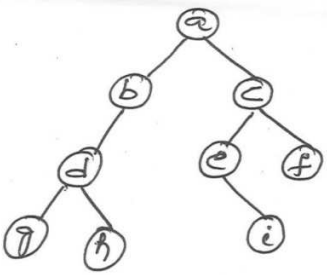
1	1.1	What type of data structure is a tree?	01
	1.2	What is the return type of calloc function?	01
	1.3	What is dangling pointer problem in C? How can it be avoided?	01
	1.4	Dynamic memory is allocated from which section of process memory?	01
	1.5	Mention the real world applications of trees.	01
	1.6	Stack can be implemented using a linked list by implementing the insertion and deletion operations at _____ and _____ ends.	01
	1.7	Compare static and dynamic memory allocation mechanisms.	02
	1.8	Evaluate the postfix expression $1234 - + * 5 -$.	02

	1.9	What will be the output of the following (n = 28)?
		$void\ lazzy(int\ n)$
		{
		$if\ (n == 0)$
		$return;$
		$printf("\%d", n\%2);$
		$lazzy(n/2);$
		}
			02

	1.10	Given pointer to a node X in a singly linked list only one pointer is given, pointer to starting node is not given, delete the node X from the given linked list.	02
	1.11	Construct a binary search tree for the given set of elements and list the last node: 40 100 25 45 25 75 10 80 150	02
	1.12	On constructing a max heap for the given set of elements (bottom-up method), what will be the left and the right child of the root node?	02
	1.13	If h is denoted as the height of a binary tree, the total number of nodes in a complete binary tree can be denoted through h as _____.	02

PART-B

2	a	Design and discuss an algorithm to evaluate a given postfix expression using stack. Trace the algorithm for the input. $6\ 3\ 2\ -\ 5\ *\ +\ 2\ *\ 3\ +$	08

	b	Assume that a stack is designed to hold the branch names (string) of a college. Discuss the appropriate push and pop function on it.	04
	c	Write a recursive function to find the sum of natural numbers.	04
3	a	Discuss the Josephus problem. Implement the same using the appropriate data structure.	08
	b	Along with syntax discuss the functions used to perform dynamic memory allocation.	04
	c	Discuss the Enqueue operation on a linear queue.	04
		OR	
4	a	Write a C program to implement message queuing system using circular queue.	08
	b	Write a C program to find the sum of an array using dynamic memory allocation.	04
	c	Discuss the Dequeue operation on a linear queue.	04
5	a	Write a C program to implement a queue using circular linked list.	08
	b	Given a singly linked list, determine if it is a palindrome or not. Return 1 if it is palindrome or 0 if it is not.	04
	c	Write a C program to insert a node based on position on to a doubly linked list with header node.	04
		OR	
6	a	Write a C function to multiply 2 polynomials using singly linked list.	08
	b	Write a C function to create an ordered circular linked list with header node.	04
	c	Write a C function to delete alternate nodes in a doubly linked list.	04
7	a	Perform the different traversal for the binary tree given below: 	06
	b	Define an AVL tree. Construct an AVL tree for the following elements. 10 20 30 25 27 7 4 23	04
	c	Write a C function to count the number of leaf nodes in a binary tree.	03
	d	Construct a splay for the following elements: 2 1 4 5 9 3	03
8	a	Define Hashing. Explain any one method to resolve collision. Given the values : $\{10,11,12,13,14,15,22,33,44,55,66,16,99,0\}$ and a hash function $h(x) = x mod 7$,show the resulting tables after inserting the values in the given order using separate chaining strategy.	08
	b	Design a C function to construct a max heap. Discuss the deletion operation on it so that it can be used to implement priority queue.	08

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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

III Semester B. E. Examinations Nov/Dec-17

Computer Science and Engineering

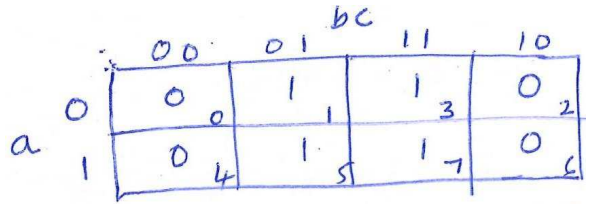
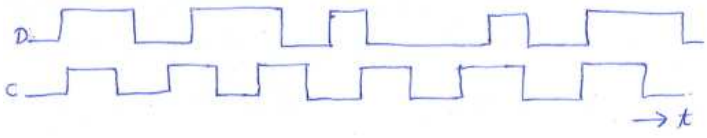
LOGIC DESIGN

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

3. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
4. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

1	1.1	In a Karnaugh map, a 'n' variable function would have _____ rows in the truth table.	01
	1.2	Write the canonical SOP and POS expression for the following Karnaugh map in decimal format. 	02
	1.3	Write the truth table and block diagram of 2 to 4 line decoder.	02
	1.4	Implement the binary half adder using basic gates.	02
	1.5	Write the circuit diagram of 1 bit comparator.	02
	1.6	Define a latch.	01
	1.7	Write the output waveforms given the following inputs to a positive edge triggered D flip-flop. Let the output be 0 initially and ignore propagation delay. 	02
	1.8	Define a register.	01
	1.9	A n-stage Johnson counter has _____ states.	01
	1.10	Write the truth table and binary state diagram for 5421 sequencer.	02
	1.11	How many flip-flops are required to implement mod-6 synchronous counter.	01
	1.12	What are state diagrams?	02
	1.13	Write the sample I/O sequence for a Moore machine to output a 1 if the input has been 1 for three consecutive clock cycles.	01

PART-B

2	a	Find the minimal sums of the following incomplete Boolean functions using Karnaugh maps: i) $f(a,b,c,d) = \Sigma(0,1,2,5,8,15) + \Sigma d(6,7,10)$ ii) $f(a,b,c,d) = \pi(2,8,11,15) + \pi d(3,12,14)$	08
	b	Find all the prime implicants of the function $f(a,b,c,d) = \Sigma(7,9,12,13,14,15) + \Sigma d(4,11)$ using Quine-Mccluskey algorithm.	08
3	a	Explain with neat diagram how to perform parallel addition and subtraction.	06
	b	Design a full adder and subtractor using $3-8$ line decoder.	10
		OR	
4	a	Implement the following function using a 4 to 1 multiplexer using b and c as the address lines: $f(a,b,c) = \Sigma(1,4,5,7)$.	08
	b	Explain the implementation of two-bit comparators.	08
5	a	With a neat diagram explain master-slave SR flip-flop.	08
	b	With the help of function table and symbols, explain positive edge triggered D flip-flop.	08
		OR	
6	a	What are registers? Explain with diagram 4 bit $SISO$ and $SIPO$ unidirectional shift register.	08
	b	With a neat diagram, explain universal shift register.	08
7	a	Design a 4 bit binary ripple up counter using negative edge triggered JK flip-flops.	06
	b	Design a synchronous Mod 6 counter using clocked JK flip-flops.	10
8	a	Design a synchronous circuit using positive edge triggered JK flip- flops with minimal combinational gating to generate the following sequence $0-1-2-0$ if input $x=0$ and $0-2-1-0$ if $x=1$. Provide an output which goes high to indicate the nonzero states in the $0-1-2-0$ sequence. Is this a Mealy machine?	10
	b	Draw the state diagram of a Mealy machine to detect as input sequence 10110 which could overlap. An output 1 is to be generated when the sequence is detected.	06

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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

III Semester B. E. Examinations Nov/Dec-17

Computer Science and Engineering

COMPUTER ORGANIZATION

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

5. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
6. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

1	1.1	List of instructions is called _____.	01
	1.2	Name that unit that control the data transfer between processor and memory.	01
	1.3	Identify the registers which facilitate the communication with the memory.	02
	1.4	Represent -6 in sign magnitude and $2's$ compliment form.	02
	1.5	Write the construction sequence for $C = A + B$ assume the operands are in processor registers.	02
	1.6	Define a stack.	01
	1.7	Write the assembly instruction to shift the contents of register R_0 arithmetic right by two bit positions.	01
	1.8	How many general purpose registers are there in ARM processor.	01
	1.9	When I/O devices and memory share the same address, the arrangement is called as _____.	01
	1.10	In which bus all devices derive timing information from a common clock line?	01
	1.11	What is meant by memory access time?	01
	1.12	Which type of memories are capable of retaining their state as long as power is supplied?	01
	1.13	What is meant by red miss and write miss?	02
	1.14	Write the booth recording for the following multiplier 001011001110101100	01
	1.15	Write the single precision $IEEE$ standard floating point format.	01
	1.16	Information needed to determine whether a device is requesting an interrupt is available in _____ register.	01

PART-B

2	a	With a neat block diagram, explain the connections between the processor and the memory	06
	b	With example explain, Big-endian and Little-endian assignments.	04

	c	Explain with example the following addressing models: i) Immediate ii) Indexed iii) Auto increment.	06
3	a	What are subroutines? Discuss the subroutine linkage using a link register.	06
	b	Explain with example shift and route instructions.	10
		OR	
4	a	Describe the ARM register structure and also write the ARM instruction format.	08
	b	Explain with example arithmetic and logic instructions of ARM.	08
5	a	With a neat diagram explain I/O interface for an input device and also write a program that reads one line from the keyboard, store it in memory buffer and echoes it back to the display.	08
	b	What are interrupts? Explain the scheme for handling simulations requests.	08
		OR	
6	a	What is DMA? Explain the registers in a DMA interface.	08
	b	With the help of a neat block diagram, explain the PCI bus operation in detail.	08
7	a	With a neat diagram, explain the organization bit cells in a memory chip.	08
	b	What are mapping functions? Explain different mapping techniques.	08
8	a	With a neat diagram, explain single bus organization of data path inside a processor.	08
	b	Write the algorithm for restoring division and use the algorithm to divide 8 by 3.	08

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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated toVTU

III Semester B. E. Examinations Nov/Dec-17

Computer Science and Engineering

DISCRETE MATHEMATICS

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

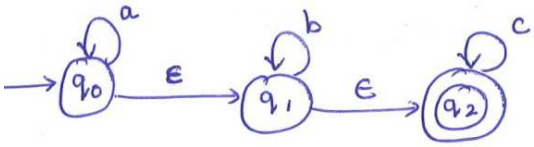
7. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
8. Answer FIVE full questions from Part B.In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

1	1.1	A six faced die is tossed four times and the numbers shown are recorded in a sequence. How many different sequences are there?	01
	1.2	Find the value of n, where $P(n,3) = 3P(n,2)$	02
	1.3	A box contains 15 IC chips of which 7 are defective and 8 are non-defective. In how many ways 5 chips can be chosen so that all are non-defective?	01
	1.4	Obtain a recursive definition for the sequence $a_n = 2 - (-1)^n$.	02
	1.5	Consider the following open statements with the set of all real numbers as the universe $p(x): \|x\| > 3, q(x): x > 3$. Find the truth value of the statement $\forall x, [p(x) \rightarrow q(x)]$	02
	1.6	Define $\in -NFA$.	02
	1.7	Obtain an NFA to accept strings of $0's$ and $1's$ such that left most symbol is different fromthe right most symbol.	02
	1.8	Let $A = \{1,2,3,4,5,6,7\}$ and $B = \{w,x,y,z\}$. Find the number of onto functions from A to B.	02
	1.9	Define Equivalence Relation with an example.	02
	1.10	Show that $(W_4,\times)$ is an abelian group where $W_4 = \{1,-1,i,-i\}$.	02
	1.11	A binary symmetric channel has probability $p = 0.05$ of incorrect transmission. If the word $c = 011011101$ is transmitted, what is the probability that triple error occurs.	02

PART-B

2	a	Find the number of arrangements of all the letters in $TALLAHASSEE$. How many of these arrangements have no adjacent $A's$?	04
	b	In how many ways can 10 identical pencils be distributed among 5 children in the following cases: i) There are no restrictions ii) Each child gets at least one pencil iii) The youngest child gets at least two pencils.	04

	c	Find the number of permutations of the English letters which contain i) Exactly two ii) At least two iii) Exactly three iv) At least three of the patterns CAR, DOG, PUN and $BYTE$.	08
3	a	Solve the recurrence relation $a_n - 3a_{n-1} = 5 \times 7^n$, for $n \geq 1$ given that $a_0 = 2$.	04
	b	Solve the recurrence relation $a_{n+2} - 4\,a_{n+1} + 3a_n = -200$, $n \geq 0$ $a_o = 3000$, and $a_1 = 3300$.	06
	c	A bank pays a certain percentage of annual interest on deposits, compounding the interest once in 3 months. If a deposit doubles in 6 years and 6 months, what is the annual percentage of interest paid by the bank?	06
		OR	
4	a	Prove that the following argument is valid, $\forall x, [p(x) \vee q(x)]$ $\exists x, \neg p(x)$ $\forall x, [\neg q(x) \vee r(x)]$ $\forall x, [s(x) \rightarrow \neg r(x)]$ _____ $\therefore \exists x, \neg s(x)$	06
	b	Prove that $R \rightarrow S$ is a valid conclusion from the premises $P \rightarrow (Q \rightarrow S), \neg R \vee P$ and Q.	06
	c	Let m and n be integers, prove that $n^2 = m^2$ if and only if $m = n$ or $m = -n$.	04
5	a	Construct a minimal DFA which accepts set of all strings over {0,1,2} which when interpreted as a binary number is divisible by 4.	04
	b	Construct a NFA for strings $\{a, b\}$ in which 3^{rd} symbol from RHS is 'a'. Also convert the constructed NFA to DFA.	12
		OR	
6	a	Define the following with example: i) Languages accepted by DFA ii) Transition function of a DFA iii) DFA iv) Languages accepted by NFA.	08
	b	Convert the given $\in -NFA$ *to* DFA. (hint: convert $\in -NFA$ to NFA and then convert NFA to DFA).  	08
7	a	Write down the Hasse diagram for the positive divisors of 45.	04

	b	let $A = \{a, b, c\}$ and R and S be relations on A whose matrices are given as $M_R = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$; $M_S = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$. Find the composite relations $R \circ S, S \circ R, R \circ R, S \circ S$ and their matrices.	06
	c	i) Let $A = \{1,2,3,4\}$ and f and g be functions from A to A given by $f = \{(1,4), (2,1), (3,2), (4,3)\}$ and $g = \{(1,2), (2,3), (3,4), (4,1)\}$. Prove that f and g are inverse of each other. ii) Let f, g, h be function from Z to Z defined by $f(x) = x - 1, g(x) = 3x$ $h(x) = \begin{cases} 0, & if\ x\ is\ even \\ 1, & if\ x\ is\ odd \end{cases}$ determine $(f \circ (g \circ h))(x)$and $((f \circ g) \circ h)(x)$.	06
8	a	State and prove Lagrange's theorem.	04
	b	Prove that $(Z_S^\star, \cdot)$ is a cycle group. Fond all its generators.	04
	c	The generator matrix for an encoding function $E: Z_2^3 \to Z_2^6$ is given by $G = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$ i) Find the code words assigned to 110 and 010 ii) Obtain the associate parity-check matrix iii) Hence decode the received words: $110110, 111101$ iv) Show that the decoding of 111111 is not possible by using H	08

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R. V. COLLEGE OF ENGINEERING

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III Semester B. E. Examinations Nov/Dec-17

Common to CS / IS / EE / EC / EI / TE

BRIDGE COURSE C PROGRAMMING

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

9. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
10. Answer FIVE full questions from Part B.In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

1	1.1	Find the value of a and b by evaluating the expression $b = a - - + + a$ when $a = 4$.	02
	1.2	What is the value of x and y if $n = 0$ in the following code. $x = 1; y = 1$ $if(n > 0)$ $\quad x = x + 1;$ $y = y + 1;$ $printf("\%d\%d", x, y);$	02

	1.3	Write the output of the following code.
		$void\ main()$
		{
		$\quad int\ i;$
		$\quad for(i = 1, i < 5;\ i + +)$
		$\quad\quad printf("\%d", i);$
		}
			02

	1.4	Write the syntax for declaring one dimensional and two dimensional array.	02
	1.5	What is precedence and associativity?	02
	1.6	What is type conversion in C.	02
	1.7	Mention the two differences between structures and unions.	02
	1.8	Write the syntax for opening and closing a file.	02

	1.9	What is output of following code:
		$main()$
		{
		$\quad int\ i = 1, j = 2, k, l;$
		$\quad k = a(i, j);$
		$\quad l = a(i, j);$
		}
		$a(int\ a, int\ b)$
		{
		$\quad int\ s, m;$
		$\quad s = a + b$
		$\quad m = a * b;$
		$\quad return(s, m);$
		}
			02

	1.10	Compare the following statements: a) break & continue b) while & do-while.	02

PART-B

2	a	Write an algorithm and flow chart to find the factorial of a number.	08
	b	Write the basic structure of 'C' program with an example.	08
3	a	With a code snippets, explain the following operators: i) Relational operators, ii) Logical operators.	08
	b	Write a 'C' Program to compute the sum of 'n' numbers.	08
		OR	
4	a	With a syntax and flow diagram, explain switch and goto statements.	08
	b	Explain the following decision making statements with code snippets. i) else if, ii) '?' conditional operators.	08
5	a	With code snippets, explain initialization of $1D$ and $2D$ array.	08
	b	Explain any 4 string handling functions.	08
		OR	
6	a	With a 'C' program to search a key in the given list of elements in an array by linear search.	08
	b	Write a 'C' program to count the number of vowels, consonants and special characters in a given string.	08
7	a	Explain array of structures and structure within a structure with examples.	08
	b	Using functions, write a C program to sort an integer number in descending order using bubble sort technique.	08
8	a	Define pointer. With code snippet, explain how the pointer variables declared and initialized.	08
	b	Write a C program to read a file 1 and write to file 2.	08