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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

III Semester B. E. Fast Track ExaminationsJuly-18

Computer ScienceEngineering

DATA STRUCTURES USING C

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

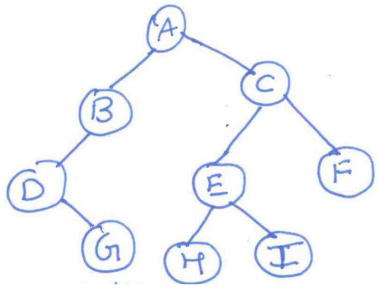
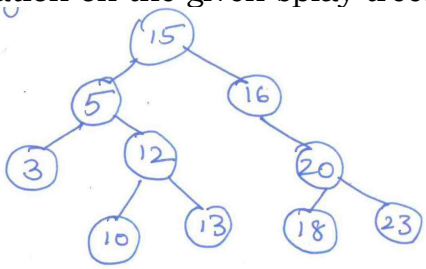
Instructions to candidates:

1. Answer all questions from PartA. Part A questions should be answered in the 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	Consider a stack of characters with maxsize=8. The current state of stack isA, C, D, F, K, _, _, _ (_ means empty allocated cell). Show the final stack after the following operations: a. Pop(stack, Item) b. Pop(stack, Item) c. Pop(stack, Item) d. Push (stack, R) e. Push (stack, L) f. Push (stack, S) g. Push (stack, P) h. Pop(stack, Item)	01
	1.2	Convert the following infix expression to postfix expression $A + B * (C - (D/E\text{^}F) * G) * H.$	02
	1.3	A circular queue of size 5 has three elements 20, 40 and 60 where front=0 and rear=2. Show the value of front and rear after each of these operations. i. insert 50. j. insert 10. k. insert 30. l. delete an item.	02

	1.4	Consider the following recursive function fun(x, y). What is the value of fun(4, 3)
		int fun(int x, int y)
		{
		If(x==0)
		return y;
		return fun(x-1, x+y);
		}
			01

1.5	Traverse the following tree and write its inorder and post order.  	02
1.6	Identify suitable data structure for the following applications: i. To develop aAadhar card like data repository. ii. Undo functionality in Photoshop or word. iii. Developer wants quick access to the recently accessed data. iv. Fixed phone book with quick lookup.	02
1.7	A has table of length 10 uses open addressing with hash function h(k)=kmod10 and linear probing. After inserting 6 values into an empty hash table, the table is as shown below. 0 | 1 | 2 | 42 3 | 23 4 | 34 5 | 52 6 | 46 7 | 33 8 | 9 | Write the order in which the keys could have been added in the table to get the above table.	02
1.8	Construct binary tree from given traversals Pre order: ABDCEF In order: BDAEFC Post order: DBFECA	02
1.9	What is the result of evaluating a prefix expression */b+-dacd where a=3, b=6, c=1 and d=5.	02
1.10	Differentiate between complete binary tree and strictly binary tree with example.	02
1.11	Perform find(10) operation on the given splay tree.  	02

PART B

2	a	Write a C program to check whether the given string is a palindrome or not using stack operations.	08
	b	Write recursive C function to find GCD of two numbers.	04
	c	Compare linear and non linear data structures with suitable examples.	04

3	a	Develop C routines to perform following operations on circular queue using arrays: i. Insertion. ii. Deletion. iii. Display.	10
	b	Bring out the difference between: i. malloc and calloc. ii. Enqueue and dequeue.	06
		OR	
4	a	Write a C program to implement display enqueue and dequeue operations on a linear queue.	08
	b	Mention any two real-time applications of stacks and queues.	04
	c	Bring out difference between linear queue and circular queue and their applications.	04
5	a	Write C routine to i. Find and print n^{th} node from last in a single linked list. Check for error condition before deletion. ii. Concatenate two circular single linked lists.	10
	b	What is a header node? What are the advantages of using header node?	03
	c	Write recursive C routine to print elements of doubly linked list in reverse order without actually reversing the list.	03
		OR	
6	a	Write a C program to add two polynomials containing variables using singly linked list.	10
	b	Given a doubly linked list of nodes containing each character of a given string. Write a C function which prints the palindrome of the swing from the given doubly linked list.	06
7	a	Write a C function to perform deletion of a node in Binary search tree.	06
	b	Show the result of inserting 2, 1, 4, 5, 9, 3, 6, 7 into an empty AVL tree. Specify type of rotation after each insertion.	10
8	a	What is the difference between BST and heap? For a given sequence of numbers construct a heap. 34, 23, 67, 45, 12, 54, 87, 43, 98, 75, 84, 93 ,31.	10
	b	Explain with examples, linear probing, quadratic probing and double hashing techniques for collision avoidance.	06

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R. V. COLLEGE OF ENGINEERING

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III Semester B. E. Fast Track Examinations July-18

Computer Science and Engineering

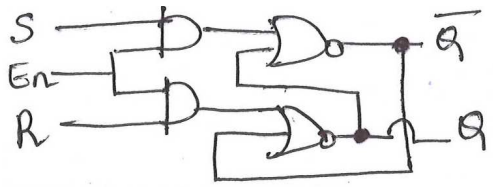
LOGIC DESIGN

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	Realize the following Boolean expression using minimum number of NOR gates only: $y = (a + c)(\bar{b} + \bar{d})(\bar{a} + \bar{b} + \bar{c})$.	01
	1.2	Convert the given expression to its minterm canonical form: $f = \bar{a}(\bar{b} + c) + \bar{c}$	01
	1.3	Simplify the given using k-map $f(a,b,c,d) = \sum m(0,1,2,3,5,7,8,10,11)$. List all essential prime implicants.	02
	1.4	Define static-1 Hazard, with an example.	01
	1.5	The circuit shown in Figure 1.5 is gated SR latch. Write its truth table and also mention the significance of Enable pin(En).  Figure 1.5	02
	1.6	Distinguish between the following: i) Latches and flip flops ii) Pulse triggered and Edge triggered flip flops.	02
	1.7	Define setup time and Hold time.	02
	1.8	Draw the circuit diagram for a 2-bit binary ripple up counter using positive edge triggered T' flip flop. Also write the waveform for five clock pulses.	02
	1.9	With the help of a state transition diagram, write the excitation table for JK flipflop.	02
	1.10	Johnson counter is called as _____.	01
	1.11	In a $SISO$ shift register, $D_0 = 1, D_1 = 0, D_2 = 1$ and $D_3 = 1$. After two clock pulses the data outputs are: _____.	01
	1.12	What are the differences between Mealy and Moore models.	02
	1.13	With an example, illustrate the significance of state assignment.	01

PART-B

2	a	Obtain the minimal sum and minimal product for the following Boolean function: $f(a,b,c,d) = (a + \bar{b})(a + c + d)(\bar{a} + \bar{b} + \bar{d}((a + \bar{c} + d)$.	04
	b	Simplify using QuineMcClusky method and determine all prime implicants for the following function: $f(a,b,c,d) = \sum m(3,4,5,7,10,12,14,15) + dc(2)$	08
	c	With a neat circuit diagram, explain the working of a basic two-input $TTL\ NAND$ gate.	04
3	a	Describe with a neat diagram a single decade BCD adder.	06
	b	Differentiate between serial binary adder and fast adder, with the help of neat diagrams.	04
	c	Implement the following function pairs using a $3-8$ line decoder with minimum gate inputs. i) $f_1(a,b,c) = \sum m(0,1,5,6,7); f_2(a,b,c) = \sum m(1,2,3,6,7)$ ii) $f_1(a,b,c) = \sum m(0,2,4); f_2(a,b,c) = \sum m(1,2,4,5,7)$	06
		OR	
4	a	List all the problems associated with an encoder. Write the condensed truth table for a $4-2$ line priority encoder where the highest priority is given to the highest bit position and obtain the minimal sum for the outputs.	06
	b	Realize a $16:1$ MUX using a $8:1$ multiplexer. Use VEM technique to condense the truth table for the function: $f(a,b,c,d) = \sum m(0,1,3,5,\ 6,7,10,12,14)$.	04
	c	Realize the following function using a $3 \times 4 \times 2$ PLA. Draw the logic diagram with the corresponding PLA table. $f_1(a,b,c) = \sum m(0,1,3,5)$ $f_2(a,b,c) = \sum m(0,2,3,4)$	06
5	a	With a neat diagram explain the working of a Master Slave JK flip flop. Also explain 0's catching and how is it overcome.	05
	b	Explain the working of a positive edge triggered 'D' flip flop with its gate diagram.	06
	c	Convert clocked SR flip flop into JK flip flop.	05
		OR	
6	a	Draw the logic diagram of a 4-bit $SISO$ and $PISO$ shift registers using JK flip flops and explain its working with an example.	06
	b	Explain the working of mod-4 ring counter with a neat diagram.	04
	c	Design a 4-bit Universal Shift register using positive edge triggered 'D' flip flop to operate as indicated in the table below:	06

$Mode$	$Select$	$Operation$
a_1	a_2	
0	0	$Shift\ right$
0	1	$Shift\ left$
1	0	$Hold$
1	1	$Parallel\ load$

7	a	With the help of a truth table and the timing diagram, construct a mod-9 asynchronous UP counter using negative edge triggered JK flip flop.	06
	b	Design a synchronous mod-6 counter using any flip flop, for the following counting sequence: $0 \rightarrow 2 \rightarrow 3 \rightarrow 6 \rightarrow 5 \rightarrow 1 \rightarrow 0\ldots$. Obtain its minimal sum equations.	10
8	a	Reduce the number of states using implication table method for the given state table:	

Present state	*Next state for inputs*		*Output for Inputs*	
	$x = 0$	$x = 1$	$x = 0$	$x = 1$
A	A	B	0	0
B	D	C	0	1
C	F	E	0	0
D	D	F	0	0
E	B	G	0	0
F	G	C	0	1
G	A	F	0	0

Draw the modified state diagram with the help of a modified state table. 08

b Construct the excitation table, transition table, state table and state diagram for the following expressions:

$D_A = \bar{A}X + BX$

$T_B = B\bar{X} + A\bar{B}X$

$Y = AB$.

Mention the type of sequential model represented by the given expressions. 08

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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

IIISemester B. E. Fast Track ExaminationsJuly-18

Computer Science and Engineering

DISCRETE MATHEMATICS

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

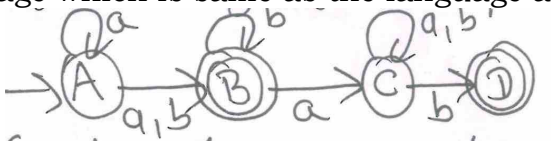
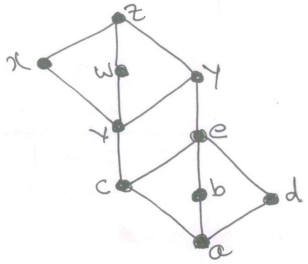
1	1.1	How many permutations of the eight letters a, c, f, g, i, t, w, x which starts with t and ends with c.	02
	1.2	how many arrangements of the letters in $MISSISSIPPI$ have no consecutive S's.	01
	1.3	Determine the co-efficient of $W^3X^2YZ^2$ in$(2W - X + 3Y - 2Z)^8$	02
	1.4	Determine the number of integer solutions of $x_1 + x_2 + x_3 + x_4 = 32$, where $x_1, x_2 \geq 5, x_3, x_4 \geq 7$.	02
	1.5	If p,qare primitive statements write the dual of the logical equivalence $(\sim p \vee q) \wedge (p \wedge (p \wedge q)) \Leftrightarrow (p \wedge q)$	01
	1.6	Let P(x) be the open statement "$x^2 = 2x$" where the universe comprises all integers. Determine whether the following statements are true or false. a. p(2) b. fxp(x) c. $\forall x P(X)$ d. $P(-2)$.	02
	1.7	Determine the sets A,B where $A - B = \{1,2,4\}\, B - A = \{7,8\}$ and $A \cup B = \{1,2,4,5,7,8,9\}$.	02
	1.8	For each of the following functions $g: R \longrightarrow R$, determine whether the function is one to one and whether it is onto. If the function is not onto, determine the rage $g(R)$. i) $g(x) = 2x - 3$ ii) $g(x) = x^3$ iii) $g(x) = x^2$ iv) $g(x) = x^2 + x$	02
	1.9	For $A = \{1,2,3,4\}$, let $R = \{(1,1), (1,2), (2,3), (3,3), (3,4)\}$ be a relation on A. draw the directed graph G on A that is associated with R^2 and R^4.	02
	1.10	Determine whether the following collection of sets is partition for the given set A, if not explain why it fails to be. $A = \{1,2,3,4,5,6,7,8\};$ $A_1 = \{4,5\}$ $A_2 = \{1,3,4\}$ $A_3 = \{6,8\}$ $A_4 = \{2,7\}$	01

	1.11	Let C be a set of code words, where $C \subseteq Z_2^7$.In each of the following, two of e(error pattern), r(received word) and c(code word) are given , with $r = c + e$. Determine the third term. $C = 1010110, r = 1011111$.	01
	1.12	Let G be the group of complex numbers $\{1, -1, i, -i\}$under multiplication. Give its multiplication table. Show that it is a cyclic group.	02

PART B

2	a	i) How many arrangements are there of all letters in SOCIOLOGICAL? ii) In how many of the arrangements in part (i) are A and G adjacent? iii) In how many arrangements in part(i) are all vowels adjacent?	06
	b	What is the co-efficient of $a^2b^3c^2d^5$ in the expansion of $(a + 2b - 3c + 2d + 5)^{16}$	04
	c	Find the number of integers between 1 and 1000 (both inclusive) that are divisible by none of 5,6 *and* 8.	06
3	a	Solve the recurrence relation. $2a_{n+2} - 11a_{n+1} + 5a_n = 0, \quad n \geq 0, a_0 = 2, a_{1=} - 8$	06
	b	Solve the recurrence relation $a_{n+2} - 4a_{n+1} + 3a_n = -200, \quad n \geq 0, a_0 = 3000, a_{1=}3300$	06
	c	Prove the following by mathematical induction. $1.3 + 2.4 + 3.5 + \cdots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . n.(n+2) = \frac{n(n+1)(2n+7)}{6}$	04
		OR	
4	a	Define the following i) The rule of universal specification. ii) The rule of universal generalization.	04
	b	Provide the reasons for the steps verifying the following argument. $\forall x[p(x) \rightarrow (q(x) \wedge r(x))]$, $\forall x[p(x)] \wedge s(x)]$, $\therefore \forall x[r(x)] \wedge s(x)$	06
	c	Prove that the following argument is valid: "If the train arrives late and there are no trains at the station then John is late his meeting: John is not late for his meeting. The train did arrive late. Therefore there were taxis at the station".	06

	Steps	Reasons
1	$\forall x[p(x) \rightarrow (q(x) \wedge r(x))]$	
2	$\forall x[p(x)] \wedge s(x)]$	
3	$p(a) \rightarrow (q(a) \wedge r(a))]$	
4	$p(a) \wedge s(a)$	
5	$p(a)$	
6	$q(a) \wedge r(a)$	
7	$r(a)$	
8	$s(a)$	
9	$r(a) \wedge s(a)$	
10	$\therefore \forall x[r(x)] \wedge s(x)$	

5	a	Define the following i) DFA ii) Language of NFA iii) $\in$-closure (q), where $q \in Q$ of an automation.	06
	b	Give DFA's accepting the following languages over the alphabet $\sum = \{a, b\}$ i) The language of all strings that do not end with ab. ii) The language of all strings in which the number of a's is even.	10
		OR	
6	a	Consider the NFA below, using the lazy evaluation method, draw the DFA accepting the language which is same as the language accepted by NFA.  Fig . 6(a)	08
	b	Construct NFA-$\in$ to accept strings over $\sum = \{a, b, c\}$ such that the string contains any number of a's followed by any number of b's followed by nay number of c's. Convert this NFA-$\in$ to NFA.	08
7	a	For $A = \{1,2,3,4\}$,Let R and S be the relations on A desgined by $R = \{(1,2), (1,3), (2,4), (4,4)\}$ and $S = \{(1,1), (1,2), (1,3), (2,3), (2,4)\}$ Find RoS, SoR, R^2, R^3, S^2 *and* S^3.	06
	b	Let $A = \{1,2,3,4,5,6,7\}$*and* $B = \{v, w, x, y, z\}$. Determine the number of onto functions $f: A \to B, where$ i) $f(A) = \{v, x\}$ ii) $f(A) = \{w, x, y\}$ iii) $\lvert f(A)\rvert = 2$ iv) $\lvert f(A)\rvert = 4$	06
	c	For $A = \{a, b, c, d, v, w, x, y, z\}$, consider the poset(A,R)whose Hasse diagram is shown below. Find glb{b,w}, lub{d,x}, least and greatest elements.  Fig. 7 (c)	04
8	a	Define the binary operation on Z by $xoy = x + y + 1$. Verify that $(Z, o)$is an abelian group.	08
	B	The encoding function $E: Z_2^2 \to Z_2^5$ is given by the generator matrix. $G = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 1 \end{bmatrix}$ i. Determine all code words. What can we say about the error detection capability of this code? What about error correction capability? ii. Find the associated parity check Matrix H. iii. Use H to decode each of the following received words. I. 11011 II. 10101 III. 11110	08

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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated toVTU

III / IV Semester B. E. Fast Track Examinations July - 18

Common to all Branches

BRIDGE COURSE C PROGRAMMING

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	Write an algorithm to find largest of two numbers.	02
	1.2	_____ operator cannot be used by floating point data.	01
	1.3	Mention whether the following decimal constants are valid or not valid: a) 12,789 b) 85$ c) 3562 d) 093.	02
	1.4	Write the output of following statements $int\ a = -11, b = 34, c = -7, d = 5.$ a) $(a > b)\&\&(b > c)$ b) $(c == a)\|\|(b! = c)$.	02
	1.5	Which of the following are valid variables: a) interest $ b) int c) sub script d) arg e) _circle.	02
	1.6	Differentiate between + and + +	02
	1.7	The _____ statement causes exit from the loop in which it is present.	01

	1.8	What is the output of the following:
		$int = 0;$
		do
		{
		$printf(\text{“}hai\text{”});$
		}
		$while(if = 0);$
			02

	1.9	What is the output of the following code:
		$main$
		{
		$int\ i = 1;$
		$switch\ (i)$
		{
		$case\ 1: printf\ (\text{“}one\text{”});$
		$case\ 2: printf\ (\text{“}three\text{”});$
		$case\ 3: printf(\text{“}four\text{”});$
		$default: printf\ (\text{“}default\text{”});$
		}
		}
			02

	1.10	For reading a character data type value, we must use the specification _____.	01
	1.11	Rectangle symbol in flow-chart represents _____.	01
	1.12	Distinguish between global and local variables.	02

PART-B

2	a	Write an algorithm and flow chart to find area of a triangle whose sides are given: [$side(S)\ S = \frac{a+b+c}{2}\ \ A = \sqrt{S(S-a)(S-b)(S-c)}$	08
	b	Explain all the data types in C with their sizes.	08
3	a	With suitable example explain the following operations: i) Bitwise operator ii) Relational operator.	08
	b	Write a C program to compute sum of n even numbers.	08
		OR	
4	a	With suitable examples compare the advantages and disadvantages of else-if ladder and switch statement.	08
	b	Write a C program to print the Floyds triangle: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	08
5	a	Explain on dimensional and 2 dimensional array initialization with suitable code snippets.	08
	b	Explain the following string handling functions with examples. i) $strlen()$ ii) $strcat()$ iii) $strcpy()$ iv) $strcmp()$.	08
		OR	

6	a	Write a C program to find the sum of n elements of an array.	08
	b	With suitable code snippets explain how to declare and initialize string variables.	08
7	a	Explain the function declaration, function call and function definition with example.	08
	b	Create a structure called employee with the following details, ename, eid and designation. Demonstrate how to create a structure employee, create 3 variables of employee, read values into employees and display this detail.	08
8	a	Write a C program to swap two numbers using pointers.	08
	b	Explain $fopen()$ and $fclose()$ with syntax and example.	08