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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated toVTU

III Semester B. E. Fast Track Examinations July-17

Computer Science and Engineering

COMPUTER ORGANIZATION AND ARCHITECTURE

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.

PART-A

1	1.1	Define MAR and MDR.	02
	1.2	$SRAM$ is used in ________ memory and $DRAM$ is used in ________ memory.	02
	1.3	Write the decimal equivalent in sign and magnitude value and $2's$ complement value of the binary number 1111.	02
	1.4	Give the RTN equivalent of the following instructions: a) $Move\ LOC, R1$ b) $Add\ R1, R2, R3$	02
	1.5	Write the Booth's recoded and bit pair recoded multiplier values for the number -6.	02
	1.6	Represent the number $1.001010 \ldots 0 \times 2^{-87}$ in $IEEE$ single precision format.	02
	1.7	Differentiate between program – controlled I/O and Memory – mapped I/O.	02
	1.8	List the MDR control signals.	02
	1.9	List any two disadvantages of clusters.	02
	1.10	Name the four steps used for processing instruction in a pipelined processor.	02

PART-B

2	a	Explain the basic operational concepts with the help of an neat diagram showing the connections between the processor and the memory.	06
	b	Perform the multiplication of 5 bit unsigned numbers of $A = 5$ and $B = 21$ to emulate the hardware arrangement for sequential multiplication.	04
	c	Write the rules for arithmetic operations on floating point numbers.	06
		OR	
3	a	List and explain the different types of computers and its uses.	06
	b	Perform the multiplication of +13 and −6 using Booth algorithm and bit pair recoding of multiplier method.	06

	c	Write the circuit arrangement for binary division and give the algorithm to perform restoring division method.	04
4	a	What is byte addressability? Explain Big – Endian and Little-Endian byte addressability concepts in a 32 bit word representation. Also, show the contents of the memory for the word “$SUPERCOP$” for both representations.	06
	b	Write a program in assembly language that can evaluate the expression: $A \times B + C \times D$, in a single accumulator processor. Assume that the processor has Load, Store, Multiply and Add instructions and that all values fit in the accumulator.	04
	c	Write the assembly code to implement $PUSH$ and POP operations.	06
		OR	
5	a	What is an addressing mode? Explain register, indirect and auto-increment modes with an example for each.	07
	b	Give the operations performed by the following instructions in an assembly program: i) $CALL$ ii) Return statement.	03
	c	Registers $R1$ and $R2$ of a computer contain the decimal values 1200 & 4600. What is the effective address of the memory operand in each of the following instructions: i) $Load\ 20(R1)\ R5$ ii) $Move\ \#\ 1000, R5$ iii) $Store\ R5, 30\ (R1, R2)$ iv) $Add - (R2), R5$ v) $Subtract\ (R1)+, R5$ vi) $Add\ \#100, R1$	06
6	a	Write an assembly program to read a line of characters from a keyboard via registers and store it in successive memory locations, using interrupts. Write comments.	08
	b	What is a $SCSI\ BUS$? Write the sequence of events that occur when the processor sends a command to the $SCSI$ controller.	08
		OR	
7	a	What do you mean by bus arbitration? Explain the two approaches to bus arbitration.	08
	b	Explain the USB architecture and its protocols.	08
8	a	Design a memory system for a memory organization of a $1K \times 1$ memory chip and explain its working.	05
	b	Differentiate between static and dynamic $RAMs$.	03
	c	Illustrate with a neat schematic block diagrams, the direct – mapping and associative – mapping techniques in cache memory.	08
		OR	

9	a	Write the steps required to read a word from memory for the instruction “$Move\ (R1), R2$” and explain with timing diagram, how the signals are enabled for the operation to be executed.	08
	b	With a neat diagram, explain the three bus organization of the processing unit and also explain the control sequence for the instruction "$Add\ R4, R5, R6$" using the above organization.	08
10	a	What is the need for pipelining in computers? Explain the basic idea of instruction pipelining.	08
	b	With a neat block diagram, explain the operand forwarding mechanism in a pipelined processor.	08
		OR	
11	a	Explain the $NUMA$ architecture with a neat diagram.	08
	b	Write short notes on:	
		i) Clusters	04
		ii) Multi processors .	04

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R. V. COLLEGE OF ENGINEERING

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III Semester B. E. Fast Track Examinations July-17

Common to CSE / ISE

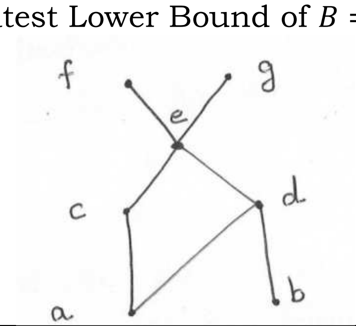
DISCRETE MATHEMATICAL STRUCTURES

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

Instructions to candidates:

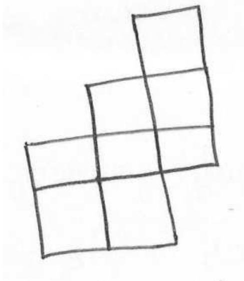
3. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
4. Answer FIVE full questions from Part B.

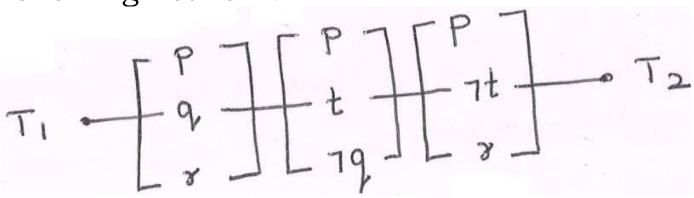
PART-A

1	1.1	Find d_5.	01
	1.2	If $A = \{2,3,4\}$ and $B = \{4, 5\}$. Find: a) $B \times A$ b) $A - B$.	02
	1.3	Find the number of non-negative integer solutions of the equation: $x_1 + x_2 + x_3 + x_4 + x_5 = 8$.	01
	1.4	Prove the following statement by mathematical induction. For all $n \in z^+$, $\sum_{i=1}^{n} i = 1 + 2 + 3 + \cdots + n = \frac{(n)(n+1)}{2}$	02
	1.5	Obtain a recursive definition for the sequence $\{a_n\}$ in the following cases: a) $a_n = 5n$ b) $a_n = 2 - (-1)^n$	02
	1.6	Let P: Today is Thanksgiving Q: Tomorrow is Friday Write the statements for $P \rightarrow Q$ and its contrapositive, converse and inverse.	02
	1.7	Prove the following argument is valid using truth-table: $[(p \rightarrow r) \wedge (\neg q \rightarrow p) \wedge \neg r] \rightarrow q$	02
	1.8	Given that $S(8,4) = 1701$, $S(8,5) = 1050$ and $S(8,6) = 266$. Evaluate $S(10,6)$.	01
	1.9	Let $A = \{1,2,3\}$ and $B = \{w, x, y, z\}$. $f = \{(1, w), (2, x), (3, x)\}$ is a function. Find the co-domain and range of f.	01
	1.10	Consider the Poset whose Hasse diagram is shown below. Find Least Upper Bound and Greatest Lower Bound of $B = \{c, d, e\}$.  	02

	1.11	Prove that a group G is abelian if and only if $(ab)^{-1} = a^{-1}b^{-1}$ for all $a, b \in G$	02
	1.12	The word $c = 1010110$ is transmitted through a binary symmetric channel. If $e = 0101101$ is the error pattern, find the word r received. If $p = 0.05$ is the probability that a signal is incorrectly received, find the probability with which r is received.	02

PART-B

2	a	Find the number of arrangements of the letters in $TALLAHASSEE$ which have no adjacent $A's$.	04
	b	Determine the number of positive integers n where $1 \leq n \leq 100$ and n is not divisible by 2, 3 or 5.	08
	c	Find the rook polynomial for the board C shown below: 	04
		OR	
3	a	Five teachers $T1, T2, T3, T4, T5$ are to be made class teachers for five classes, $C1, C2, C3, C4, C5$, one teacher for each class. $T1$ and $T2$ do not wish to become the class teachers for $C1$ or $C2$, $T3$ and $T4$ for $C4$ or $C5$ and $T5$ for $C3$ or $C4$ or $C5$. In how many ways can the teachers be assigned the work (without displeasing any teacher)?	06
	b	Determine the co-efficient of: i) $x^2y^2z^3$ in the expansion of $(x+y+z)^7$, ii) x^5y^2 in the expansion of $(x+y)^7$.	06
	c	A certain question paper contains two parts A and B each containing 4 questions. How many different ways a student can answer 5 questions by selecting at least 2 questions from each part?	04
4	a	The number of bacteria in a culture is 1000(approximately) and this number increases 250% every two hours. Use a recurrence relation to determine the number of bacteria present after one day.	06
	b	Solve the recurrence relation $a_{n+2} - 4a_{n+1} + 3a_n = -200, n \geq 0$ and $a_0 = 3000;\ a_1 = 3300$.	06
	c	Solve the recurrence relation $a_n - 3a_{n-1} = 5 \times 7^n \ for\ n \geq 1$, given that $a_0 = 2$.	04
		OR	
5	a	Solve the recurrence relation $F_{n+2} = F_{n+1} + F_n \ for\ n \geq 0$, given $F_0 = 0, F_1 = 1$. (Hint: $F_0, F_1, F_2, \ldots. F_n$ represents Fibonacci sequence)	06
	b	Find a generating function for the recurrence relation $a_{n+1} - a_n = 3^n, n \geq 0$ and $a_0 = 1$. Hence solve the relation.	10

6	a	Simplify the following network: 	08
	b	Establish the validity of the following argument: If the band could not play rock music or the refreshments were not delivered on time, then the New year's party would never been canceled and Alicia would have been angry. If the party were canceled, then refunds would have had to be made. No refunds were made. Therefore the band could play rock music.	08
		OR	
7	a	Establish the validity of the following argument $\forall x\ [p(x) \vee q(x)]$ $\forall x\ \left[\left(\neg p(x) \wedge q(x)\right) \rightarrow r(x)\right]$ ____________________ $\therefore \forall x\ [\neg r(x) \rightarrow p(x)]$	08
	b	Show that the following argument is invalid p $p \vee q$ $q \rightarrow (r \rightarrow s)$ $t \rightarrow r$ ____________________ $\therefore \neg s \rightarrow \neg t$	05
	c	Prove the following statement in 3 different ways: i) Direct proof ii) Indirect proof and iii) Proof by contradiction. "If n is an odd integer, then $n + 11$ is an even integer"	03
8	a	If $A = \{1, 2, 3, 4\}$ and R, S are relations on A defined by $R = \{(1,2), (1,3), (2,4), (4,4)\}$; $S = \{(1,1), (1,2), (1,3), (1,4), (2,3), (2,4)\}$ Find $RoS, SoR, R^2, S^2, R^c, S^c$.	06
	b	Draw the Hasse diagram representing the positive divisors of 36.	04
	c	Let $A = \{1, 2, 3, 4\}$ and $B = \{1, 2, 3, 4, 5, 6\}$ i) Determine how many functions are there from A to B. How many of these are one- to –one? How many are onto? ii) Determine how many functions are there from B to A. How many of these are onto? How many are one- to –one?	06
		OR	
9	a	Let $f: R \rightarrow R$ be defined by $f(x) = \begin{cases} 3x - 5, & x > 0 \\ -3x + 1, & x \leq 0 \end{cases}$ Find: i) $f(0), f(-1)$ and $f\left(-\frac{5}{3}\right)$ ii) $f^{-1}(1), f^{-1}(3)$.	05

	b	Let $f, g, h: R \to R$, where $f(x) = x^2, g(x) = x + 5$ and $h(x) = \sqrt{x^2 + 2}$. Prove $\left((h \circ g) \circ f\right) = \left(h \circ (g \circ f)\right)$.	05
	c	Let $A = \{1, 2, 3, 4\}$. Give an example of a relation R on A that is: i) Reflexive and symmetric, but not transitive. ii) Reflexive and transitive, but not symmetric. iii) Symmetric and transitive, but not reflexive.	06
10	a	Determine the cyclic subgroups generated by the elements [2] and [3] of the group $(Z_6, +)$.	04
	b	For the group $G = (Z_{12}, +)$ and the subgroup $H = \{[0], [4], [8]\}$ of G, determine all the left cosets of H in G. Also, obtain the corresponding coset decomposition of G.	06
	c	If $G = (Z_6, +), H = (Z_3, +)$ and $K = (Z_2, +)$ prove that G and $H \times K$ are isomorphic.	06
		OR	
11	a	An 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 the code-words. What can be said about the error-detection capability of this code? What about its error-correction capability? ii) Find the associated parity-check matrix H. iii) Use H to decode the received words: $11101, 11011$	12
	b	Define Group Code with example.	04