

DBMS: Assignment 0

Total Marks : 20

June 29, 2018

Question 1

Intentional definition of a set $B = \{x \mid x \in Z \text{ and } |x| < 4\}$, where Z is the set of integers. Find out its correct extensional notation from the following? *MCQ, Mark 1*

- a) $\{0, 1, 2, 3\}$
- b) $\{1, 2, 3\}$
- c) $\{-3, -2, -1, 0, 1, 2, 3\}$
- d) $\{-3, -2, -1, 1, 2, 3\}$

Answer: c)

Explanation: if $|x| = 1$ then $x = \{-1, 1\}$. Now as given, $|x|$ can be of 3, 2, 1 & 0. So $x = \{-3, -2, -1, 0, 1, 2, 3\}$

There are two ways of describing or notating the members of a set:

- i) *Extensional*: An extensional definition is denoted by enclosing the list of members in curly brackets
- ii) *Intentional*: intentional definition uses a rule or semantic description to denote the members

Question 2

Let $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ $B = \{x : x \text{ is an even number}\}$ & $C = \{2, 4\}$. Which of the following statement/s true about the sets A, B & C. *MSQ, Mark 1*

- a) $C \subset B \subset A$
- b) $B \subset A$
- c) $C \subset B$
- d) $\Phi \subset A$

Answer: c), d)

Explanation: The set 'B' is not a finite set. So options a) & b) are discarded. Again Φ is subset of any set.

Question 3

Which of the following sets is the super set for the other three sets ?

MCQ, Mark 1

- a) The set of whole numbers
- b) The set of natural numbers
- c) The set of negative whole numbers
- d) The set of integers

Answer: d)

Explanation: The set containing all objects or elements and of which all other sets are subsets. It is denoted as 'U' or 'E'.

Question 4

Let $A = \{\text{Ram, Sam, Merry, Cherry}\}$, $B = \{\text{Merry, Sam, Ravi}\}$. Choose the correct results from the following for the operations $A \cup B$, $B \cap A$ and $A - B$ respectively *MCQ, Mark 1*

- a) $\{\text{Ram, Sam, Merry, Cherry, Ravi}\}$, $\{\text{Sam, Merry}\}$, $\{\text{Ram, Cherry}\}$
- b) $\{\text{Ram, Sam, Merry, Cherry, Ravi}\}$, $\{\text{Sam, Merry}\}$, $\{\text{Ram, Cherry, Ravi}\}$
- c) $\{\text{Ram, Sam, Merry, Cherry}\}$, $\{\text{Sam, Merry}\}$, $\{\text{Ravi}\}$
- d) $\{\text{Ram, Sam, Merry, Cherry, Ravi}\}$, $\{\text{Ravi}\}$, $\{\text{Ram, Cherry}\}$

Answer: a)

Explanation: *UNION:* It is the set of all elements that are members of either A or B

INTERSECTION: It is the set of all elements that are members of both A and B

SUBTRACTION: It is the set of all elements that are members of A but not members of B

Question 5

If U is the set of integers excluding zero, V is the set of even integers, and D is the set of odd integers, which of the following statement/s is/are true. *MSQ, Mark 1*

- a) $\bar{V} = \bar{D}$
- b) $U - V = D$
- c) $\bar{V} = D$
- d) $V = \bar{D}$

Answer: b), c), d)

Explanation: Follow the definition of universal set and difference operation.

Question 6

Let A and B be two distinct finite sets. Find out the wrong statement/s from the following about the Cartesian product *MCQ, Mark 1*

- a) $A \times B \neq B \times A$
- b) $|A \times B| = |A| \times |B|$
- c) $A \times \phi = A$
- d) $|A \times B| = |B \times A|$

Answer: c)

Explanation: As per the properties of Cartesian product, $A \times \phi = \phi$

Given two non-empty sets A and B, the set of all ordered pairs (x, y), where $x \in A$ and $y \in B$ is called Cartesian product of A and B; $A \times B = \{(x, y) | x \in A \text{ and } y \in B\}$. Cartesian product is not commutative

Question 7

Which of the following relations imply De Morgan's laws

MSQ, Mark 1

- a) $\overline{A \cup B} = \bar{A} \cap \bar{B}$
- b) $A \triangle B = (A - B) \cup (B - A)$
- c) $|A \cup B| = |A| + |B| - |A \cap B|$
- d) $\overline{A \cap B} = \bar{A} \cup \bar{B}$

Answer: a), d)

Explanation: De Morgan's laws: $\overline{A \cup B} = \bar{A} \cap \bar{B}$, $\overline{A \cap B} = \bar{A} \cup \bar{B}$

Question 8

A relation $R = \{(4, 7), (0, -1), (-3, -7), (3, 5)\}$. Identify the correct set of domain 'D' and range 'G' in Inverse of R (R^{-1}) *MCQ, Mark 1*

- a) $D = \{4, 7, 0, -1\}$, $G = \{-3, -7, 3, 5\}$
- b) $D = \{4, 0, -3, 3\}$, $G = \{7, -1, -7, 5\}$
- c) $D = \{7, -1, -7, 5\}$, $G = \{4, 0, -3, 3\}$
- d) $D = \{7, -1, 4, 0\}$, $G = \{-7, 5, -3, 3\}$

Answer: c)

Explanation: $R^{-1} = \{(7, 4), (-1, 0), (-7, -3), (5, 3)\}$ The set of all first elements in a relation R, is called the domain of the relation R, and the set of all second elements called images, is called the range of R

Question 9

Consider two relations $R1 = \{(2, 3), (1/2, 0), (2, 7), (4, 6)\}$ and $R2 = \{(x, y) | x \in Z, y = x^2\}$. Z specifies positive whole numbers. Which of the following is/are true ? *MCQ, Mark 1*

- a) Both R1 and R2 are the functions
- b) R1 is a Function But not R2
- c) R2 is a Function But not R1
- d) Both R1 and R2 are not functions

Answer: c)

Explanation: Since $(2, 3)$ and $(2, 7) \in R1$ Where $R1(2) = 3$ and $R1(2) = 7$. So $R1(2)$ does not have a unique image. Thus $R1$ is not a function. But in case of $R2$ For every 'x' there is an unique image as y in the given relation.

Function: A relation f from a set A to a set B is said to be function if every element of set A has one and only one image in set B.

Question 10

For the set $A = \{1, 2, 3, 4\}$ The relation $R1 = \{(2,2), (2,4), (4,2), (4,4)\}$. Identify the correct properties of relation that R1 satisfies. *MSQ, Mark 1*

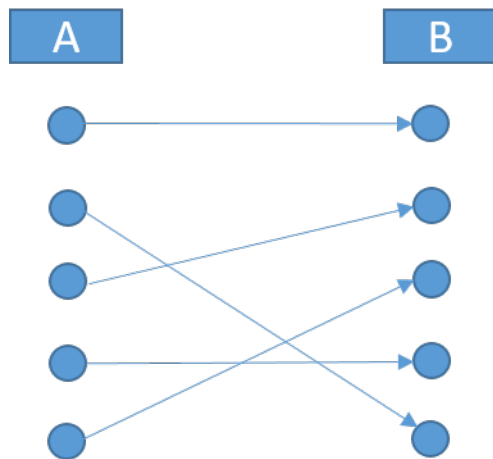
- a) Symmetric
- b) Transitive
- c) Asymmetric
- d) Reflexive

Answer: a), b)

Explanation: A relation R on a set A is called **symmetric** if $(b,a) \in R$ holds when $(a,b) \in R$. A relation R on a set A is called **transitive** if $(a,b) \in R$ and $(b,c) \in R$ then $(a,c) \in R$ for all $a,b,c \in A$. Asymmetric relation is opposite of symmetric relation. A relation R on a set A is called **asymmetric** if no $(b,a) \in R$ when $(a,b) \in R$. A relation R on a set A is called **reflexive** if $(a,a) \in R$ holds for every element $a \in A$. Here $(1,1)$ and $(3,3)$ is not there in $R1$.

Question 11

Consider the figure given below. The function from set A to B is _____. *MCQ, Mark 1*



- a) A general function
- b) Injective, but not surjective (one to one)
- c) Surjective, but not injective (onto)
- d) Bijective (a one-to-one correspondence)

Answer: d)

Explanation: There is a perfect "one-to-one correspondence" between the members of the sets. So it is bijective (both injective and surjective together).

Question 12

What is the correct translation of the statement: "Some real numbers are rational" into mathematical logic ? *MCQ, Mark 1*

1

- (A) $\exists x (\text{real}(x) \vee \text{rational}(x))$
- (B) $\forall x (\text{real}(x) \rightarrow \text{rational}(x))$
- (C) $\exists x (\text{real}(x) \wedge \text{rational}(x))$
- (D) $\exists x (\text{rational}(x) \rightarrow \text{real}(x))$

- a) A
- b) B
- c) C
- d) D

Answer: c)

Explanation: (A) "There exist some numbers which are either real OR rational"

(B) "All real numbers are rational"

(C) "There exist some numbers which are both real AND rational"

(D) "There exist some numbers for which rational implies real"

(Go through Propositional Logic for details). So Clearly answer C is correct among all

Question 13

A logical binary relation \triangle , is defined as follows:

A	B	$A \triangle B$
True	True	True
True	False	True
False	True	False
False	False	True

Let \sim be the unary negation (NOT) operator (negation of true is false and vice versa), with higher precedence than \triangle . Which one of the following is equivalent to conventional $A \wedge B$ ($A \wedge B$ is only true when both A and B are true)? *MCQ, Mark 1*

- a) $(\sim A \triangle B)$
- b) $\sim (A \triangle \sim B)$
- c) $\sim (\sim A \triangle \sim B)$
- d) $\sim (\sim A \triangle B)$

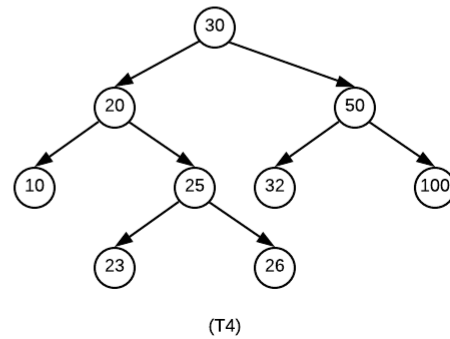
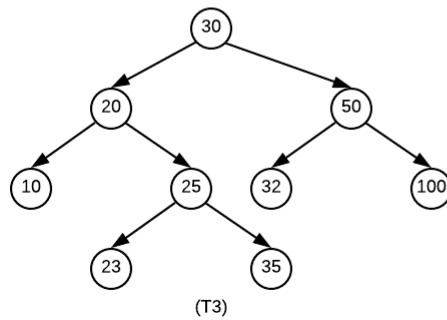
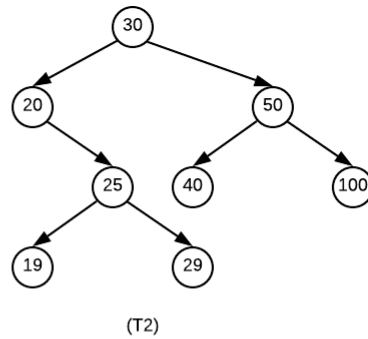
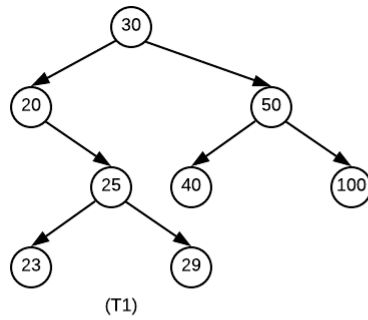
Answer: d)

Explanation: In $A \wedge B$, we have 3 entries as False, and one as True. In table, it is opposite case, so we have to negate $A \triangle B$, moreover, we want True only when both A and B are true, so in 3rd entry (which becomes true after negation), we want both true, so we have to negate A also. So $A \wedge B \equiv \sim (\sim A \triangle B)$, so option (d) is correct. Source: [Click Here](#)

Question 14

Which one of the following is/are Binary search tree/s ?

MCQ, Mark 1



- a) T1 & T2
- b) T2 & T3
- c) T1, T3 & T4
- d) T1, T2 & T4

Answer: d)

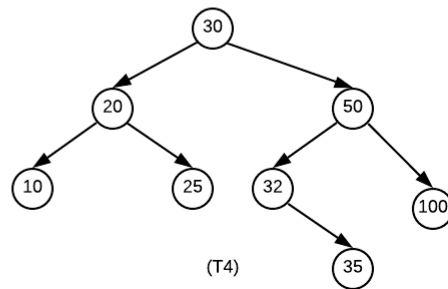
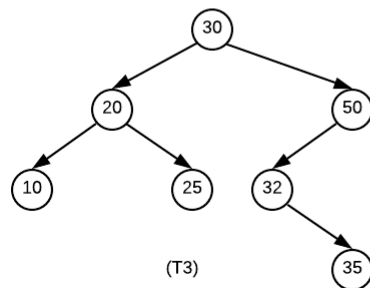
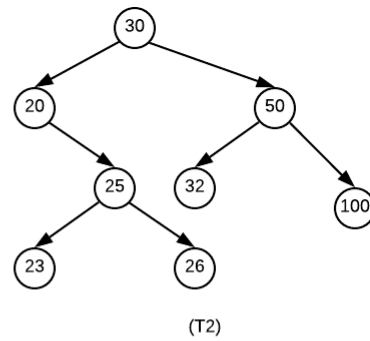
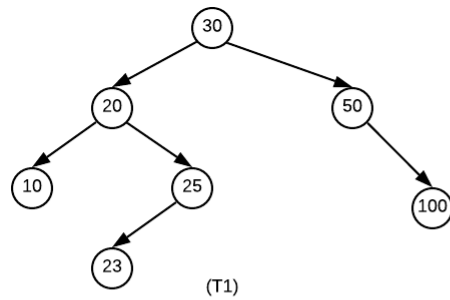
Explanation: A BST is a binary tree of nodes ordered in the following way:

- i) The keys in the left subtree are less than the key in its parent node
- ii) The keys in the right subtree greater than the key in its parent node

Question 15

Which one of the following is/are Balanced Binary search tree/s ?

MSQ, Mark 1



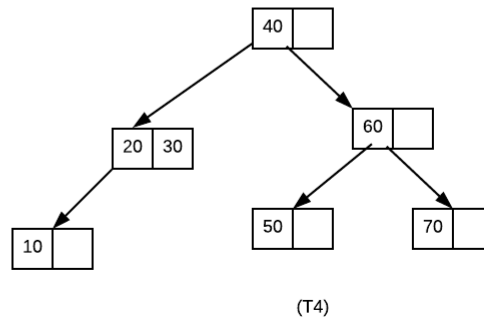
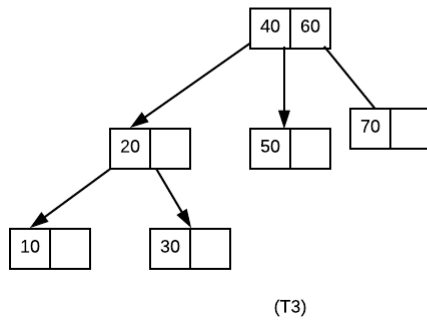
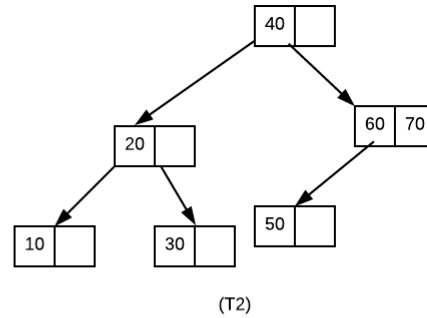
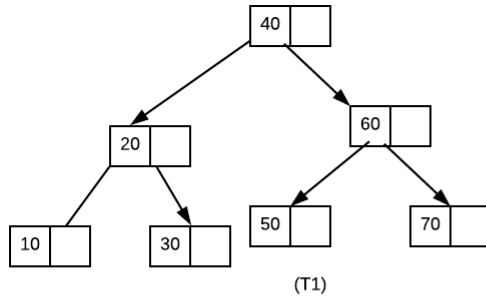
- a) T1
- b) T2
- c) T3
- d) T4

Answer: a), d)

Explanation: A tree is balanced if difference between heights of left and right subtrees is at most ± 1 for all nodes of the given tree.

Question 16

Identify the correct constructed B-tree of order 3 by inserting the elements {10, 20, 30, 40, 50, 60, 70}.
MCQ, Mark 1



- a) T1
- b) T2
- c) T3
- d) T4

Answer: a)

Explanation: B-Tree of Order 'm' contains maximum 'm-1' key values in a node and maximum 'm' children for a node and should satisfy the following properties:

- All the leaf nodes must be at same level.
- All nodes except root must have at least $\lceil m/2 \rceil - 1$ keys and maximum of m-1 keys.
- All non leaf nodes except root (i.e. all internal nodes) must have at least $m/2$ children.
- If the root node is a non leaf node, then it must have at least 2 children.
- A non leaf node with n-1 keys must have n number of children.
- All the key values within a node must be in Ascending Order.

Question 17

Which of the following statement(s) is/are TRUE ?

MCQ, Mark 1

- (i) A hash function takes a message of arbitrary length and generates a fixed length code.
 - (ii) A hash function takes a message of fixed length and generates a code of variable length.
 - (iii) A hash function may give the same hash value for distinct messages.
- a) (i) Only
 - b) (ii) and (iii) only
 - c) (i) and (iii) only
 - d) (ii) Only

Answer: c)

Explanation: Hash function is defined as any function that can be used to map data of arbitrary size of data to a fixed size data.. The values returned by a hash function are called hash values, hash codes, digests, or simply hashes : Statement 1 is correct Yes, it is possible that a Hash Function maps a value to a same location in the memory that's why collision occurs and we have different technique to handle this problem : Statement 3 is correct. eg : we have hash function, $h(x) = x \bmod 3$ According to Statement 1, no matter what the value of 'x' is $h(x)$ results in a fixed mapping location. According. to Statement 3, $h(x)$ can result in same mapping mapping location for different value of 'x' e.g. if $x = 4$ or $x = 7$, $h(x) = 1$ in both the cases, although collision occurs.

Question 18

Given the following input (4322, 1334, 1471, 9679, 1989, 6171, 6173, 4199) and the hash function $x \bmod 10$, which of the following statements are TRUE ?

MCQ, Mark 1

- (i) 9679, 1989, 4199 hash to the same value
 - (ii) 1471, 6171 has to the same value.
 - (iii) All elements hash to the same value.
 - (iv) Each element hashes to a different value
- a) (i) Only
 - b) (ii) only
 - c) (i) & (ii) Only
 - d) (iii) & (iv) Only

Answer: c)

Explanation: Hash function given is $\bmod(10)$. 9679, 1989 and 4199 all these give same hash value i.e 9 1471 and 6171 give hash value 1

Question 19

Merge sort makes two recursive calls. Which statement is true after these recursive calls finish, but before the merge step? ? *MCQ, Mark 1*

- a) The array elements form a heap.
- b) Elements in each half of the array are sorted amongst themselves.
- c) Elements in the first half of the array are less than or equal to elements in the second half of the array.
- d) None of the above.

Answer: b)

Explanation: Follow merge sort technique

Question 20

Which of the following are in the intermediate or final steps of Quick Sort Algorithm QUICK-SORT(A, 0, 7) when it is run on array $A = \{3, 9, 5, 3, 1, 4, 8, 7\}$? *MCQ, Mark 1*

- a) $\{1, 3, 3, 4, 5, 7, 8, 9\}$
- b) $\{3, 3, 1, 9, 5, 3, 8, 7\}$
- c) $\{1, 3, 3, 9, 5, 4, 8, 7\}$
- d) $\{1, 3, 3, 7, 5, 4, 8, 9\}$

Answer: a), c), d)

Explanation: Follow standard quick sort technique