

D 53015

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Name

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, JANUARY 2014

(CUCSS)

Computer Science

CSC IC 01—DISCRETE MATHEMATICS

Time : Three Hours

Maximum : 36 Weightage

I. Answer *all* questions :

1. Given $A = \{x / x \text{ is a positive integer } < 12\}$, $B = \{x / x \text{ is an integer and } 1 < x < 6\}$,
 $C = \{x / x \text{ is an integer and } x^2 < 25\}$. Find number of elements in $A \cup B \cup C$, $A \cap B \cap C$.
2. Give examples of countable and uncountable infinite sets.
3. If $A \cup B = A \cup C$ must $B = C$? Explain.
4. Let $A = \{a, b, c, d\}$ and R be the relation $\{(a, b), (b, a), (b, c), (c, d), (d, b)\}$. Draw the digraph of R .
5. Differentiate function and a relation.
6. Give examples of linear homogeneous and non-linear homogeneous recurrence relations. Find their degree.
7. $(\mathbb{Z}, +)$, $(\mathbb{E}, +)$ be groups where \mathbb{Z} , \mathbb{E} are set of integers and set of even integers. $f : \mathbb{Z} \rightarrow \mathbb{E}$ be defined as $f(x) = 4x$. Is f a homomorphism ?
8. Define Hamming distance. Illustrate.
9. Define Modus ponens and modus tollens.
10. Show that the premise p leads to the conclusion $p \vee q$.
11. Let the partial order of divisibility be defined on $A = \{2, 4, 8, 16, 32\}$. Draw Hasse diagram of this relation.
12. Define the set of strings denoted by the regular expression $0(OVI)^*1$.

(12 x 1 = 12 weightage)

II. Answer any *six* questions :

13. If X, Y are subsets of A then prove that $(A - X) \cap Y = Y - X$.
14. **Show that if** any successive positive integers are chosen, then two of them will leave same remainder upon division by 7.

Turn over

15. Find the explicit formula for Fibonacci term.
16. Classify types of recurrence relations with examples.
17. Differentiate group, monoid, semi group using examples.
18. Define an encoding function $e: B^3 \rightarrow B^8$. Comment on the number of errors detected.
19. Show that Hasse diagram D_n under the relation of divisibility and $D_n =$ set of divisors of n , is a lattice.
20. Give example of 8 element Hasse diagram that is Boolean algebra.
21. Compute the truth table of Boolean expression $p(x, y, z) = (x \vee y) \wedge (z \wedge \neg x)$.

(6 x 2 = 12 weightage)

III. Answer any *three* questions :

22. An urn contains 15 balls, 8 are red and 7 are black. In how many ways can 5 balls be chosen so that :
 - (a) all are red.
 - (b) all are black.
 - (c) 2 red and 3 black.
 - (d) atleast 2 are red.
23. (a) Prove that sum of 5 consecutive integers is divisible by 5.
 - (b) Find the recurrence relation of the sequence 3, 7, 11, 15, ... and find the explicit formula.
 - (c) Using characteristic functions show that $(A \oplus B) \cap C = A \oplus (B \cap C)$.
24. Define various types binary relations with examples.
25. (a) Define normal group, cyclic group and provide examples.
 - (b) Consider the 4 state machine as follows (with S_0 as start state).

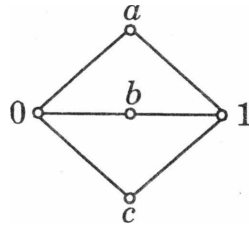
	0	1
S_0	S_0	S_1
S_1	S_1	S_2
S_2	S_2	S_3
S_3	S_3	S_0

Find the state with input 11011.

26. Find group code $e B^2 \rightarrow B^5$ with parity check matrix.

$$\begin{array}{r}
 \mathbf{H} = \begin{array}{c}
 \begin{array}{ccc}
 0 & 1 & 1 \\
 0 & 1 & 1 \\
 1 & 0 & 0 \\
 0 & 1 & 0 \\
 0 & 0 & 1
 \end{array}
 \end{array}
 \end{array}$$

27. (a) Given the lattice below, comment on distributive and complement properties.



(b) Find the boolean expression of the table below.

$E(x, y, z)$	1	0	1	0	1	0	0	1
x	0	0	0	1	1	1	0	1
y	0	0	1	0	0	1	1	1
	0	1	0	0	1	0	1	1

(3 x 4 = 12 weightage)