D▶ 22427 (Pages : 2) Name..................................

Reg. No...............................

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, JANUARY 2012

Computer Science

CSC IC 01—DISCRETE MATHEMATICS

(2010 admissions)

Time : Three Hours Maximum Weightage : 36

Part A

Answer **all** *questions.*
Each question carries 1 **weightage.**

1. List the subsets of the set B = {1, {2, 3}}.
2. Let U = (0, 1, 2, ... A = (1, 2, 3), B = (2, 4) then find :
   (a) U – (A *n* B)▶
   (b) (A – B) v Ac.
3. State the axioms which a set must obey so that it may form a group.
4. Define a subgraph give example.
5. Differentiate field and a skew field.
6. Find the dual of the Boolean expression $x^1yz^1 + x^1y^1z$.
7. Negate the following statements :
   (a) If she studies she will pass in exam.
   (b) If it rain then they will not go for picnic.
8. Consider the string x = well, find all prefixes and suffixes of *x*. Also find all subwords of x.
9. Construct DFA for string over {0, 1) ending with 011.
10. Define DFA. Give example.
11. Design DFA that accepts the string having even number of 0's over the input set (0, 1).
12. Symbolize the expression "x is the father of the mother of y".

(12 x 1 = 12 weightage)

Part B

Answer any **six** *questions.*
Each question carries 2 **weightage.**

13. If R is a relation in the set of integers Z defined as R = {(x, y) : *x* E *Z*, *y* E Z, (X – y) is divisible by 6). Then prove that R is an equivalence relation.
14. Prove that (A – B) = A *n* B^c.

Turn over

15. Show that if every element of a group (G, 0) be its own inverse then it is an abelian group.

16. Find the inverse of the permutation $\begin{vmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 5 & 4 \end{vmatrix}$

17. Using generating function solve the recurrence relation $a_n = 3a_{n-1} + 2 ; a_0 = 1$.

18. Find the generating function for the sequence ~~1, a, a^2, ... Where a is affixed constant.~~

19. Prove that the proposition $(p \quad q)\ q\ (\sim q \quad p)$ *is a* tautology.

20. Simplify the following using Boolean algebra :

    (a) (A + B + AB) (A + C).

    (b) XY + X^cYZ^c + YZ.

21. Construct finite state machine that perform serial addition.

(6 x 2 = 12 weightage)

Part C

Answer any **three** *questions.*
Each question carries 4 ***weightage.***

22. Given E = $\{a, b\}$ construct DFA that recognize the language $L = \{b^m ab \ : m, n > 0\}$.

23. Let R = ((1, 2), (2, 3), (3, 1)) and A = {1, 2, 3} find the reflexive, symmetric and transitive closure of R using composition of matrix relation R.

24. Define Lattice. Write its properties. Show that every chain is a distributive lattice.

25. Solve $a_{n+2} - 5a_{n+1} + 6a_n = 2$ with initial condition $a_0 = 1$ and $a_1 = -1$.

26. Find the product of two permutations and show that it is not commutative :

$$f = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \end{pmatrix} \quad g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 2 & 1 & 4 \end{pmatrix}$$

27. Obtain PCNF of $(p \rightarrow (q \wedge R)) \quad p \wedge (\sim q \quad R))$.

(3 x 4 = 12 weightage)