STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

(For candidates admitted during the academic year 2011 – 12& thereafter)

B.Sc/ B.A/ B.Com Degree End Semester Examination - April 2015

SUBJECT CODE: 11MT/GE/DM44

COURSE : GENERAL ELECTIVE **MAXIMUM MARKS : 100**
PAPER : DISCRETE MATHEMATICS
TIME : 3 HOURS

SECTION – A (10 x2 =20)

Answer ALL TheQuestions:

1. Verify whether $(P \vee Q) \vee \neg (P \wedge Q)$ is a contradiction or tautology.
2. Determine the truth value of the following statement:
   U= $\{1,2,3,4,5\}$; $\exists x \forall y,\ 5x - y \leq 15$.
3. Define a partially ordered set with an example.
4. What is Hasse diagram?
5. State the Duality and Idempotent laws in a lattice.
6. Let $N = \{1,2,3,...\}$ be ordered by divisibility. State whether each of the following subsets of N are linearly ordered:
   i) {2,4,18}; ii) {3,21,9};
7. Write the dual of each Boolean expression $(a * 1) + (a' + 0) = a + b$.
8. Write the output sequence *Y* for a NOT gate with input *A* where *A*is given as follows:
   i) 00111110; ii) 11100111;
9. Explain regular expressions and regular Languages.
10. What are Godel Numbers?

SECTION – B (5 x 8 =40)

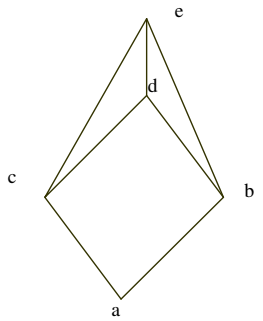
Answer Any Five Questions:

11. a) State De Morgan's theorem.

    b) Draw the truth table of $((p \rightarrow q) \wedge p) \rightarrow \neg q$. (2+6)

..2

12. Let $S = \{a, b, c, d, e\}$ be ordered as in the following Hasse Diagram.



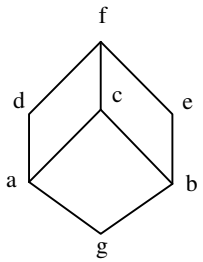
a) Find all minimal and maximal elements of *S*.
b) Does *S* have a first element or a last element?
c) Is *d* and *a* comparable?
d) Is *c*<*b*?

13. a) Suppose the English Alphabet *A* = {a,b,c,d,…} is given the usual alphabetical order and $A^2 = A \times A$ is given the product order. Insert the correct symbol <, >or $\prec$, $\succ$ or || :

i) *yd*___ *us*; ii) *gy* ___*gt*; iii) *ca* ___*xc*;

b) Let *C*={1,2,…, 16} be ordered by divisibility. Draw the Hasse diagram for *C* and check whether it is a Poset. (3+5)

14. a) What are Isomorphic Lattices? Give an example.
b) Check whether the given Hasse diagram is Lattice.
c) If so determine whether it is distributive and bounded?
d) Identify the atoms in it.



15. Consider the Boolean Algebra D_{210}.
a) List its elements and draw its diagram.
b) Find the set of atoms.
c) Find a subalgebra with eight elements.
d) Is *X*={1,2,7,70} a sublattice of D_{210}?

16. a) Consider the words $u = a^2b^2a^3$ and $v = bab^3$. Find uv and v^2.
b) Explain Finite state Automata. (4+4)

17. Let L be the set of all words in a and b with an even number of a's. Find a grammar G which will generate L.

SECTION – C (2 x 20 =40)

Answer Any Two Questions:

18. a) Determine the validity of the following argument: $(p \to q), \neg q \mapsto \neg p$.

b) Define the two quantifiers and Negate each of the following statements:

i) $(\exists z \in A)(z - 3 < 8)$; ii) $(\forall x \in A)(27 - x^2 < 9)$
iii) $\exists x \forall y, q(x, y)$; iv) $\forall x \forall y \exists z, \neg p(x, y, z)$ (10+10)

19. a) Check whether the set Z of integers and Q set of rational numbers, with the usual order $\leq$, is linearly ordered and well ordered.

b) Let T= {2, 3, 6, 12, 24, 48}. R on T={(x,y)$\in$R, x divides y}

i) Construct Hasse diagram.
ii) Find maximal and minimal element.
iii) Give chains and antichains.
iv)Find the maximal length of chains.
v) Is this poset a lattice? (10+10)

20. a) Explain the logical gates with an example and mention few of their applications.
b) If a Finite Automaton M is given by $M = (S, A, f, Y, s_0)$, where
$S = \{s_0, s_1, s_2, s_3\}, A = \{0,1\}$, Y={s_0,s_2} and $f$is given by the following table:

	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

Draw the state diagram and find the language of$M$. (10+10)