STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2004 – 05 & thereafter)

SUBJECT CODE : MT/MO/DM54

B. Sc. DEGREE EXAMINATION, NOVEMBER 2007
BRANCH I - MATHEMATICS
FIFTH SEMESTER

COURSE : MAJOR – OPTIONAL
PAPER : DISCRETE MATHEMATICS
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A **(10 X 2 = 20)**

ANSWER ALL THE QUESTIONS

1. Define conditional statement.
2. Verify whether $(p \wedge (p \leftrightarrow q)) \rightarrow q$ is a tautology.
3. Obtain the PDNF for $\neg$PVQ.
4. Define a chain and give an example.
5. Define a finite automaton.
6. Construct an finite automaton accepting all strings in {0,1} having even number of 0's and even number of 1's.
7. Show that any finite subset is regular.
8. Define finite state machine.
9. Define phrase-structure grammar.
10. Write the grammar for GNF.

SECTION – B **(5X8=40)**

ANSWER ANY FIVE QUESTIONS

11. a) Obtain a disjunctive normal form of $\neg(P \vee Q) \leftrightarrow (P \wedge Q)$.
    b) Show that $R \rightarrow S$ can be derived from the premises.

12. a) show that even chain is a lattice.
    b) Show that any chain is modular.

13. If L be the set accepted by an NFA, M, show that there exists an FA, M' which accepts L.

14. Find FA, M such that T(M) is the set of all strings over {0,1} ending in 10.

15. State and prove Pumping Lemma.

16. Find a grammar in CNF equivalent to a grammar whose productions are $S \rightarrow aAbB$, $A \rightarrow aA / a$, $B \rightarrow bB / b$.

17. Every context-free language L can be generated by a CFG in GNF. Prove.

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SECTION – C **(2X20=40)**

ANSWER ANY TWO QUESTIONS

18. a) Obtain the principle disjunctive normal form of
$P \to ((P \to Q) \wedge \neg(\neg Q \vee \neg P))$.

b) Show that $(\forall x)(P(x) \vee Q(x)) \Rightarrow (\forall x)P(x) \vee (Fx)Q(x)$.

19. a) Prove that a lattice L is modular if and only if none of its sublattices is isomorphic to the pentagon lattice N_5.

b) Find the principal disjunctive normal form of
$p(x_1, x_2, x_3) = (x_2 + x_1 x_3)\overline{((x_1 + x_3)x_2)}$

20. State and prove Chomsky Normal form.