CODE No.:16MC1BS01 **SVEC16**

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to JNTUA, Anantapur)

M.C.A. I Semester (SVEC16) Regular/Supplementary Examinations January - 2018
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
[MASTER OF COMPUTER APPLICATIONS]

Time: 3 hours **Max. Marks: 60**

Answer One Question from each Unit
All questions carry equal marks

UNIT-I

1. a) Prove that $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ — 6 Marks

   b) Derive $P \rightarrow (Q \rightarrow S)$ using the rule C P if necessary from $P \rightarrow (Q \rightarrow R), Q \rightarrow (R) \rightarrow S)$. — 6 Marks

(OR)

2. a) Obtain the principal disjunctive normal form of the formula $P \rightarrow (P \wedge (P \rightarrow Q))$. — 6 Marks

   b) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q, Q \rightarrow R, P \rightarrow M$ and $\neg M$ — 6 Marks

UNIT-II

3. What is equivalence relation? If A = {1,2,3,4}, give an example of relation on A that is : — 12 Marks
   i) Reflexive and symmetric, but not transitive
   ii) Reflexive and transitive, but not symmetric
   iii) Symmetric and transitive, but not reflexive

(OR)

4. a) If A = {1, 2, 3, 5, 30} and R is the divisibility relation, prove that **(A, R)** is a lattice but not a distributive lattice. — 6 Marks

   b) Define Inverse function. Consider the function $f: R \rightarrow R$ defined by $f(x) = 2x + 5$. Let a function $g: R \rightarrow R$ be defined by $g(x) = \frac{1}{2}(x - 5)$. Prove that **g** is an inverse of **f**. — 6 Marks

UNIT-III

5. a) What is group? Explain the axioms of a group with a suitable example. — 6 Marks

   b) Show that any group G is abelian iff $(ab)^2 = a^2b^2$ for all $a, b \in G$. — 6 Marks

(OR)

6. a) Consider the semi group $(R^+,*)$ and $(R, +)$ where R^+ is the set of all positive real numbers with usual multiplication * and + is the usual addition. Let the function $f: R^+ \rightarrow R$ be defined by $f(x) = \log_e x$ for any $x \in R^+$. Is f an isomorphism? Justify. — 6 Marks

   b) Use mathematical induction to prove that $n^3 - n$ is divisible by **3** whenever **n** is a positive integer. — 6 Marks

UNIT-IV

7. Find the generating functions for the following sequences. — 12 Marks
   i) $1^2, 2^2, 3^2, \ldots$ ii) 0, 2, 6, 12, 20, 30, 42......... iii) $1^3, 2^3, 3^3, \ldots$

(OR)

8. Solve the recurrence relation $a_n = 6a_{n-1} - 12a_{n-2} + 8a_{n-3}$, given that $a_o = 1$, $a_1 = 4$ and $a_2 = 28$. 12 Marks

UNIT-V

9. a) Distinguish between Euler circuits and Hamiltonian circuits. 6 Marks

   b) Explain Breadth first search and Depth first search algorithm for a spanning tree. 6 Marks

(OR)

10. a) Show that a connected multigraph has an Euler circuit if and only if each of its vertices has even degree. 6 Marks

    b) Define chromatic number of graph. Find the chromatic number of the following: 6 Marks
    i) Tree ii) Complete graph (Kn) iii) cycle (Cn)

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