Total No. of Questions : 8] [Total No. of Printed Pages : 3

Roll No ....

MCA-102

M.C.A. I Semester

Examination, November 2018

Mathematical Foundation of Computer Science

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) If A, B, C are any three sets, then prove that:

 i) $A-(B\cup C)=(A-B)\cap(A-C)$

 ii) $A\times(B\cup C)=(A\times B)\cup(A\times C)$

 b) For the two mappings $f:R\to R$ defined by $f(x)=x^2\ \forall\, x\in R$, and $g:R\to R$ defined by $g(x)=\sin x\ \forall\, x\in R$. Then show that $(gof)x\neq(fog)x$.

2. a) Let $A=\{1,2,3\}$, $B=\{a,b,c\}$ and $C=\{x,y,z\}$ be three sets. Let R and S be the relations from A to B and B to C respectively defined by $R=\{(1,b),(2,a)(2,c)\}$ and $S=\{(a,y),(b,x)(c,y)(c,z)\}$. Then find matrices M_R, M_S and M_{SOR}.

 b) Prove that $5^{2n}-1$ is divisible by 24, where n is any positive integer.

3. a) i) Prove that $p\wedge q\Rightarrow q\vee p$ is a Tautology.

 ii) Write converse, inverse and contrapositive of the conditional statement $p\Rightarrow q$.

 b) Let $L=\{1,2,3,4,6,8,9,12,18,24\}$ be ordered by the relation '|' where $x|y$ means x divides y. Then show that D_{24} the set of all divisors of the integer 24 is a sub lattice of the lattice $(L,|)$.

4. a) Draw the simplified switching circuit of the function:

 $F(x,y,z)=x\cdot y'\cdot z+(z+y)\cdot x'$

 b) If $(A,\leq)$ and $(B,\leq)$ are two posets, then show that $(A\times B,\leq)$ is a poset where the ordering $\leq$ on $A\times B$ defined by $(a,b)\leq(a',b')\Leftrightarrow a\leq a'$ in A and $b\leq b'$ in B.

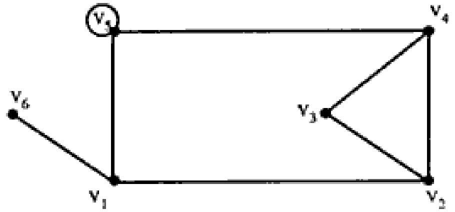
5. a) Prove that intersection of two subgroups of a group G is a subgroup of G but union of two subgroups is not necessarily a subgroup of G.

 b) Show that the set of numbers of the form $a+b\sqrt{2}$ with a and b as rational numbers, is a field.

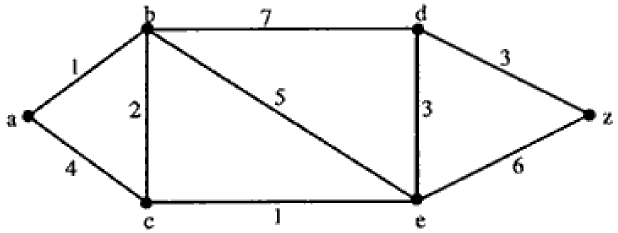
6. a) Explain the following:
 i) Connected graph
 ii) Complete graph
 iii) Spanning tree
 iv) Binary tree

b) Prove that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$.

7. a) Write the adjacency matrix of the graph:



b) Find shortest path from a to z for the following weighted graph:



8. a) Define numeric function. Find the generating function corresponding to numeric function $a_r = 2^r + 3^r$.

b) Solve the recurrence relation:

$a_r - 6a_{r-1} + 8a_{r-2} = 0$ given $a_0 = 3$ and $a_1 = 2$.

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