Code: **CSCS1T2**

I M.Tech - I Semester – Regular/Supplementary Examinations – January - 2017

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(COMPUTER SCIENCE & ENGINEERING)

Duration: 3 hours   Max. Marks: 70
Answer any FIVE questions.   All questions carry equal marks

1. a) Prove that for any propositions p, q and r, the compound proposition {P$\rightarrow$(Q$\rightarrow$R)} $\rightarrow$ {(P$\rightarrow$Q)$\rightarrow$(P$\rightarrow$R)} is a tautology.   7 M

   b) Construct a truth table for each of these following statements.   7 M
   i) (A $\wedge$ ~B) $\rightarrow$ (C $\vee$ D)
   ii) (P $\vee$ Q) $\oplus$ (P $\wedge$ Q)

2. a) Show that r$\rightarrow$s can be derived from   7 M
        p $\rightarrow$ (q$\rightarrow$s) , r $\vee$ p and q .

   b) (i) Derive Predicate, Quantifiers and (ii) Write the rules of inferences.   7 M

3. a) Draw the hasse diagram representing the positive divisors of 36.   7 M

b) Verify that R= {(1,1),(2,2),(3,3),(4,4),(1,2),(2,1)} is an equivalence relation on the set A= {1,2,3,4} find the corresponding partition on A.   7 M

4. a) Prove that $<Z^{*}_{5} , .>$ is a cyclic group. Find all its generators   7 M

b) Given A={2,3,4}, B={1,2} and C={4,5,6} find A+B, B+C, A+B+C and (A+B)+(B+C)   7 M

5. a) Define Pigeon hole principle   7 M

b) How many solutions are there to the equation $x_1+x_2+x_3+x_4+x_5+x_6=29$, where x_i, $i = 1,2,3,4,5,6$ is a nonnegative integer such that   7 M
i) $x_i > 1$ for $i = 1,2,3,4,5,6$?   ii) $x_1 <= 5$?
iii) $x_1 < 8$ and $x_2 > 8$?

6. a) In a survey of 60 people it was found that 25 read weekly magazines, 26 read fortnightly magazines, 26 read monthly magazines, 9 read both weekly and monthly magazines, 11 read both weekly and fortnightly magazines, 8 read both fortnightly and monthly magazines and 3 read all three magazines. Find   7 M

i) The number of people who read at least one of the three magazines, and

ii) The number of people who read exactly one magazine

b) Solve the recurrence relation $a_n=8a_{n-1}+10^{n-1}$ with $a_1=1$ using generating function method. 7 M

7. a) Find the shortest path from a to z in the graph shown below using Dijkstra's algorithm. 7 M
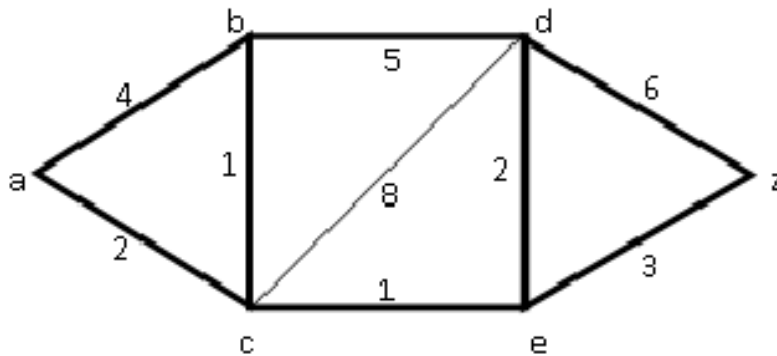
b) Write short notes on 7 M
i) Graph isomorphism
ii) Planar graphs
iii) Graph coloring

8. a) Write an algorithm for Breadth- first search. 7 M

b) Find minimum spanning tree for the following graph using Kruskal's algorithm.   7 M