JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2017
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to CSE, IT)

Time: 3 Hours   Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A
(25 Marks)

1.a) Express the formula in terms of P->Q {↑} only. [2]
b) Define tautology, contradiction and contingency of formula. [3]
c) Explain about Lattice and its Properties. [2]
d) Show whether following graphs are isomorphic or not. [3]
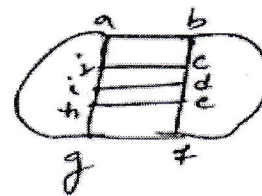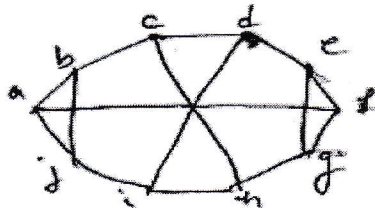
e) Show that intersection of two submonoids of a monoid is a monoid. [2]
f) A book binder is to bind 10 different books in red, blue and brown cloth. In how many ways can he do this if each color of cloth is to be used for at least one book? [3]
g) Let X = {1, 2, 3, 4, 5, 6, 7} and R = {(x, y) |x - y is divisible by 3} in X. Show that R is an equivalence relation. [2]
h) Solve simultaneous recurrence relations:
$a_n = 3a_n + 2b_{n-1}$ [3]
i) Distinguish between following terms Cycle and Circuits. [2]
j) Describe various methods to generate spanning trees. [3]

PART-B
(50 Marks)

2. Obtain the PDNF and PCNF of the following formulas.
P ∨ (~P-> (Q ∨ (~Q->R)) [10]

OR

3.a) Construct the truth table for the following statement (P → Q) ∨ (¬P → R).
b) Show that the following statements are logically equivalent without using truth table. (P → R) ∧ (Q → R) ⇔ (P∨Q) → R [5+5]

4.a) Let (S1, *1), (S2, *2) and (S3, *3) be semi groups and f: S1 -> S2 and g:S2 ->S3 be homomorphisms. Prove that the mapping of g o f: S1 -> S3 is homomorphism.
b) Prove that H = {0, 2, 4} forms a subgroup of (Z6, +). [5+5]

OR

5.a) Draw the Hasse diagram of: (P(S), <=), where P(S) is power set of the set S= {a, b, c}.

b) How many relations can be defined on a set with `n' elements? If a set A has 'm' elements and a set B has `n' elements, how many relations can be defined from A to B? If a set A = {1, 2}, determine all relations from A to A. [4+6]

6 A student is to answer 12 of 15 questions in an examination. How many choices does the student have:
(a) in all
(b) if he must answer the first two questions
(c) if he must answer the first or second but not both
(d) if he must answer exactly 3 of the first 5 questions
(e) if he must answer atleast 3 of the first 5 questions. [10]

OR

7.a) In how many ways can 23 different books be given to 5 students so that 2 of the students will have 4 books each and the other 3 will have 5 books each.

b) Discuss Pigeon hole principle. [5+5]

8.a) Solve the recurrence relation $a_n - 7a_{n-1} + 12a_{n-2} = 0$ for $n \geq 2$, $a_0=1$ and $a_1=2$.

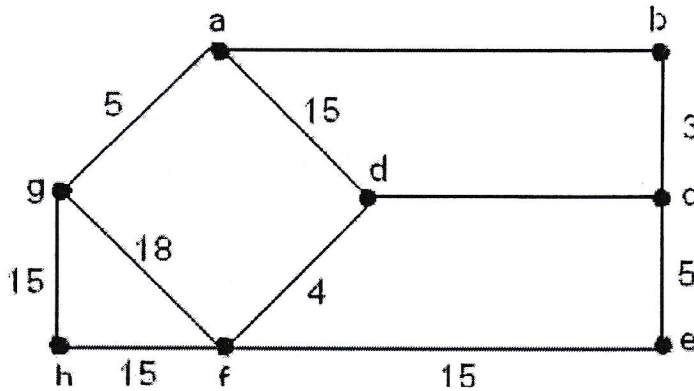b) Solve the recurrence relation of Fibonacci series. [5+5]

OR

9.a) What is the recurrence relation for towers of Hanoi problem? Obtain a solution for it.

b) Solve following recurrence relation $a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = n2^n$. [5+5]

10.a) Write an algorithm to determine if a connected graph is Eulerian, using its adjacency list representation.

b) Write an algorithm to determine if a connected graph contains an Eulerian path, using its adjacency matrix. [5+5]

OR

11.a) State the kruskal's algorithm for Finding Minimal Spanning Tree.

b) Determine spanning tree for the following figure using kruskal's algorithm. [5+5]

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