R13

Code No: 113BN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November - 2015
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) Verify whether the following inference is valid or not.

Statement 1 : If today is 2nd October then today is Gandhi's birthday.

Statement 2 : Today is not 2nd October

Inference : Today is not Gandhi's birthday

[2M]

b) Express P↔Q in terms: [3M]
   i) Implication and AND
   ii) In terms of AND, OR, NOT
   iii) In terms of EX-OR.

c) Define group. [2M]

d) Let X = {1, 2, 3, 4} and a partition of X is given as { {1,2}, { 3, 4}}. Find the corresponding equivalence relation for given partition. [3M]

e) List the 3-combinations of {3a, 2b, 4c} [2M]

f) Enumerate the number of binary numbers with seven 1's and five 0's. [3M]

g) Find the general solution for the recurrence.
$a_n = a_{n-1} + f(n)$, $n \geq 0$ and a_0 is given initial condition [2M]

h) Find the co-efficient of X^9 in $(1+x^3+x^8)^{10}$. [3M]

i) Find the cut vertices and cut edges in the following graph (figure 1). [2M]

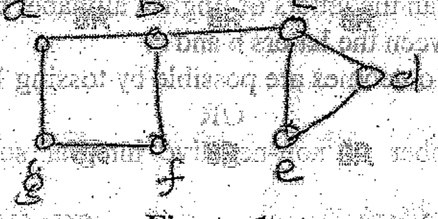

Figure: 1

j) How many regions will be there in a tree with 'n' vertices? Give explanation in one or two lines. [3M]

PART-B **(50 Marks)**

2.a) Obtain PCNF and PDNF by using truth table for the formula.
$(P \rightarrow Q) \vee (Q \leftrightarrow R)$

b) Using automatic theorem proving, show that $(P \rightarrow Q)$, $\sim Q$ logically implies $\sim P$. [5+5]

OR

3.a) Show that $\sim (P \rightarrow Q) \rightarrow \sim (R \vee S)$, $((Q \rightarrow P) \vee \sim R)$, R logically implies $P \leftrightarrow Q$.

b) Show that the set of following premises are inconsistent. [5+5]

Premise 1 : If today is 1st April then today is fool's day
Premise 2 : If today is 1st April then $2+2 \neq 8$
Premise 3 : If today is fool's day then $2+2 = 8$
Premise 4 : Today is 1st April.

4.a) Let X = {ball, bed, dog, let, egg} and R is a relation defined on X as R= {(x, y)| x and y contains some common letter}. Show that R is compatibility relation and also find maximum compatibility blocks for R.

b) Draw the Hasse diagram for the relation R = {(x, y) | x divides y} on X= {2, 3, 6, 12, 24, 36}. [5+5]

OR

5.a) Consider the following Hasse diagram shown in figure 2 for the relation "divides" and find the upper bounds and lower bounds for: i) { 2, 3} ii) { 3, 4, 6}.

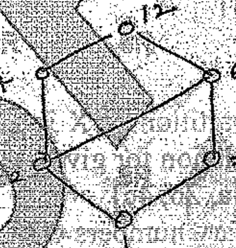

Figure: 2

b) Verify the following system is group or not G= {1, 2, 3, 4, 5} and the operation $+_6$. Where $+_6$ represents additive module 6. [5+5]

6.a) In how many ways can the letters of English alphabet be arranged so that there are exactly 6 letters between the letters b and c.

b) How many different outcomes are possible by tossing 15 similar coins? [5+5]

OR

7.a) Enumerate the number of non-negative integral solutions to the in equality $X_1+X_2+\ldots+X5 \leq 12$.

b) Find the co-efficient $X^5Y^5Z^{10}$ in the expansion $(2X+5Y-3Z)^{20}$. [5+5]

8. Solve the recurrence relation
$a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = 0$, where $n \geq 3$ and $a_0 = 1$, $a_1 = 1$, $a_2 = 2$. [10]

OR

9.a) Solve the recurrence relation $a_n = a_{n-1} + 1/n\,(n+1)$ where $a_0 = 2$.

b) Write the generating function for the following sequence $B = \{b_r\}^{\alpha}_{r=0}$ where [5+5]

$$b_r = \begin{cases} 1 \text{ if } & 0 \leq r \leq 4 \\ 2 \text{ if } & r = 5 \\ 0 \text{ if } & r \geq 6 \end{cases}$$

10. Consider the following Graph (Figure 3).

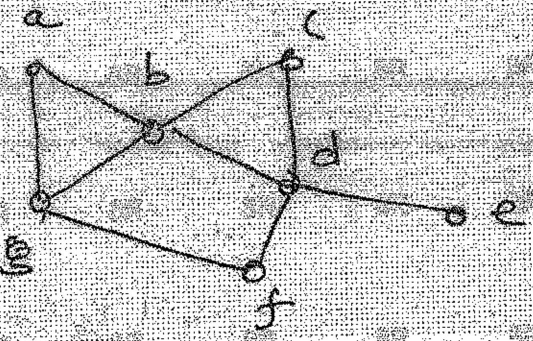

Figure: 3

With respect to the above graph decide whether the each of the following paths are simple, closed, circuit and cycle.

a) a-b-c-d-b-g-a

b) a-b-c-e-f

c) g-b-d-f-g

d) a-b-d-e

e) a-b-d-e-d-b-a. [2+2+2+2+2]

OR

11.a) Verify whether the following graph (Figure 4) contains Hamiltonian cycle or not.

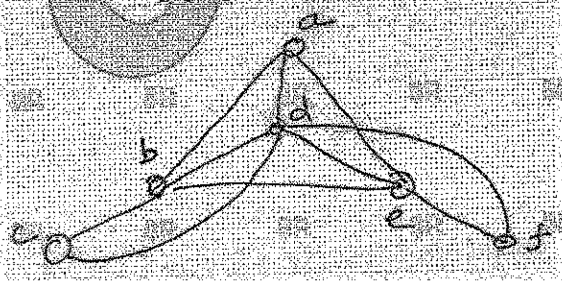

Figure: 4

b) Show that the complete graph K_n is planar if $n \leq 5$. [5+5]

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