

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]

[3M]

b) Express $P \leftrightarrow Q$ in terms:

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]

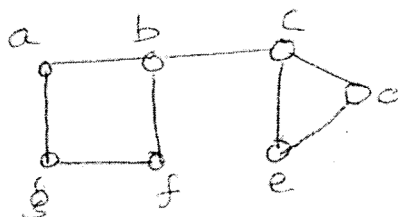


Figure: 1

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.
 $(P \rightarrow Q) \vee (Q \vee R)$
 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 $X = \{\text{ball, bed, dog, let, egg}\}$ and R is a relation defined on X as $R = \{(x, y) \mid x \text{ and } y \text{ contains some common letter}\}$. Show that R is compatibility relation and also find maximum compatibility blocks for R .
 b) Draw the Hasse diagram for the relation $R = \{(x, y) \mid x \text{ divides } y\}$ 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) $\{3, 4, 6\}$.

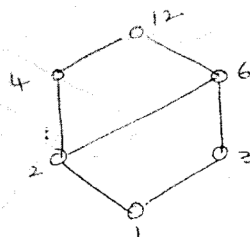


Figure: 2

- 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 inequality $X_1 + X_2 + \dots + X_5 \leq 12$.
 b) Find the co-efficient $X^5 Y^5 Z^{10}$ 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 $B = \{b_r\}_{r=0}^{\infty}$ 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).

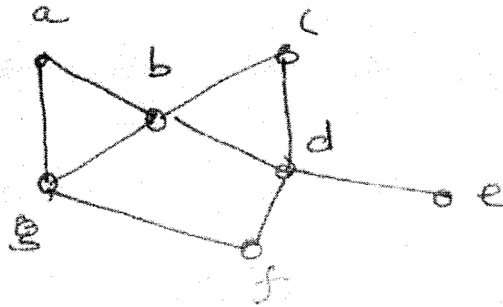


Figure: 3

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.

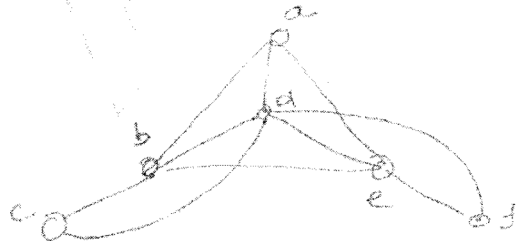


Figure: 4

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

[5+5]

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