Code No. 4210/N

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I Sem. Suppl. Examination

May/June - 2008

Subject : Discrete Structures

Time : 3 hours] [Max. Marks : 75

Note : Answer ***all*** questions of Part-A.
Answer ***five*** questions from Part-B.

PART - A (25 marks)

1. How many circular arrangements are possible, if six people sit about a round table ?
2. Prove that $\neg R$ is a valid conclusion from the premises $P, P \rightarrow \neg Q, \neg Q \rightarrow \neg R$.
3. Let $A = \{1, 2, 3, 4\}$ and $f: A \rightarrow A$ defined by $f = \{(1,2), (2,2), (3,1), (4,3)\}$; find f^3 and f^4.
4. If $A=\{1, 2, 3, 4\}$, give an example of relation R on A that is reflexive and symmetric, but not transitive.
5. Obtain the Generating Function of the Series 1,0,1,0,1,0,.......
6. Define Recurrence Relations.
7. Let the permutations of the elements of $\{1, 2, 3, 4, 5\}$ be given by

$$\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 4 & 5 \end{pmatrix} \qquad \beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 5 & 4 \end{pmatrix}$$

Solve the equation $\alpha x = \beta$.

8. Define group homomorphism.
9. What is a Hamiltonian path ? Give an example.
10. Draw self dual graph on four vertices.

PART - B (5×10=50 marks)

11. (a) For the following program segment, m and n are integer variables. The variable A is a two-dimensional array A[1,1], A[1,2], ... A[10,20], with 10 rows and 20 columns.

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for m : = 1 to 10 do
  for n : = 1 to 20 do
    A[m,n]:=M+3*n
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Write the following statements in symbolic form.

(i) All entries of A are positive.

(ii) All entries of A are positive and less than or equal to 70.

(iii) Some of the entries of A exceed 60.

(iv) The entries in the first three rows of A are distinct.

(b) Agarwal has two unmarked containers, one holds 17 litres and other holds 55 litres . Explain how Agarwal uses these containers to measure exactly one litre.

12. (a) Show that if 8 people are in a room, at least two of them have birthdays that occur on same day of the week.

(b) Let A be the set of factors of positive integer 120 and let $\leq$ be the relation divides (i.e.) $\leq = \{(x,y) | x \in A \wedge y \in A \wedge (x \text{ divides } y)\}$. Draw Hasse diagram for $< A, \leq >$.

(c) What is a partial order set ?

13. (a) Solve Recurrence Relation

$$a_{n+2} - 5\,a_{n+1} + 6a_n = 2 \qquad n \geq 0$$

$$a_0 = 3,\ a_1 = 7$$

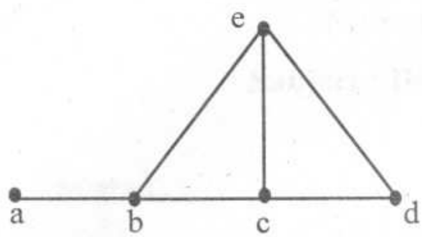
(b) A ship carries 48 flags, 12 each of the colors, red, white, blue and black. Twelve of these flags are placed on vertical pole in order to communicate a signal to other ships. How many of these signals use an even number of blue flags and an odd number of black flags ?

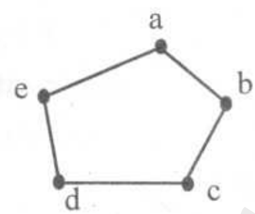
14. (a) Compute the inverse of each element in Z_7 using fermats theorem.

(b) Prove that "A code can detect all combinations of k or fewer errors if the minimum distance between any two code words is at least k + 1".

15. (a) State and prove Euler's theorem.

(b) Determine the chromatic polynomials for the given graphs.





If five colors are available in how many ways can the vertices be colored ?

16. Devise a single-error correcting group code and associated decoding table when m=3 and n=7.

17. (a) How many arrangements of letters in MISSISSIPPI have no pairs of consecutive identical letters ?

(b) For any $n \in Z^+$, prove that the integers 8n+3 and 5n+2 are relatively prime.