Vighnes Priya

Code No. : 4009

9490024924

FACULTY OF SCIENCE

M.Sc. I Semester Examination

April/May – 2007

COMPUTER SCIENCE

Paper-1.1 – Discrete Mathematical Structure

Time : 3 Hours] **[Max. Marks : 100**

Note : Answer **all** questions.

SECTION – A (8 × 5 = 40)

1. Symbolize the propositions.
"It is humid and cloudy, or it is raining, but at the same time it is false that it is both humid and raining."

2. Show that modus tollens is a valid rule of inference.

3. Show that in any graph, the sum of degrees of the vertices is twice the number of edges.

4. Show that in a connected planar graph with e edges and v vertices, $3v - e \geq 6$. v-e+v=2

5. How many ways can we get a sum of 4 or 8 when two distinguishable dice are rolled ?

6. Show that $c(n, r) = c(n-1, r) + c(n-1, r-1)$.

7. Find the coefficient of x^{20} in $(x^3 + x^4 + x^5 + \ldots)^5$. $x^{20} \to$ 9C4 or 9C5

8. Find a particular solution of $a_n - 4a_{n-1} + 4a_{n-2} = 2^n$. $a_n^p = cn^2 2^n$

SECTION – B (4 × 15 = 60)

9. (a) (i) Analyze the following argument and determine whether it is a valid argument.
"If I get the job and work hard, then I will be promoted. I was not promoted. Thus either I did not get the job or I did not work hard."

(ii) Prove that $(P \to q) \wedge (\sim r \to \sim q) \wedge \sim r \to \sim p$ is a tautology.

OR

(b) (i) Show that $(P \rightarrow q) \rightarrow r$; $(P \wedge \sim q) \rightarrow r$ are equivalent.

(ii) Minimise the Boolean expression

$x'yz' + x'y'z' + xy'z' + xyz + xy'z$ using Karnaugh maps.

10. (a) (i) Show that if a connected planar graph G has e edges and r regions, then $r \leq \frac{2}{3}$ e.

(ii) Let G = (V, E) be a graph in which V = {a, b, c, d, e} and E = {(a, b), (b, a), (a, c), (a, d), (b, c) (d, e)}.

Draw a representation of G and find a directed path in G from a to e.

OR

(b) (i) Show that a tree always has one fewer edge than vertices.

(ii) Show that $k_{3,3}$ is a non-planar graph.

11. (a) (i) How many arrangements are there of {8.a, 6.b, 7.c} in which each a is on at least on side of another a ?

(ii) How many integral solutions are there of $x_1 + x_2 + x_3 + x_4 = 20$ if $2 \leq x_1 \leq 6$, $3 \leq x_2 \leq 7$, $5 \leq x_3 \leq 8$ and $2 \leq x_4 \leq 9$?

OR

(b) (i) How many ways can 12 white pawns and 12 black pawns be placed on the black squares of an 8 × 8 chess board ?

(ii) From a group of 10 professors how many ways can a committee of 5 members be formed so that at least one of professor A and professor B will be included ?

12. (a) (i) Find the coefficient of x^{10} in$(x^3 + x^4 + \ldots)^2$.

(ii) Let $A = \begin{bmatrix} 4 & 6 \\ 1 & 5 \end{bmatrix}$. For $n \geq 0$, solve for the entries of A^n using recurrence relations.

OR

(b) (i) Calculate the coefficient of x^{15} in

$(x^2 + x^3 + x^4 + x^5)\ (x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7)$
$(1 + x + \ldots + x^{15})$

(ii) Solve $\sqrt{a_n} - \sqrt{a_{n-1}} - 2\sqrt{a_{n-2}} = 0$ where $a_0 = a_1 = 1$.