Total Printed Pages : 3

Code No. 5601/M

FACULTY OF INFORMATICS

M.C.A. I-Year I Sem. (Main) Examination, 103086

February/March, 2012

Subject : DISCRETE MATHEMATICS

Time : 3 Hours] **[Max. Marks : 80**

Note : Answer *one* question from each Unit. All questions *carry equal* marks.

UNIT - I

1. (a) Construct a truth table for the following compound propositions. **10**
   (i) $(P \rightarrow Q) \rightarrow (\sim Q \rightarrow \sim P)$
   (ii) $(P \rightarrow Q) \rightarrow (Q \rightarrow P)$

   (b) What are quantifiers ? Explain the different types of quantifiers. **6**

OR

2. (a) Show that for any two sets A and B, $A - (A \cap B) = A - B$. **6**
   (b) Reduce the given expression to sum of products form using don't care combinations. **10**

   $f(w, x, y, z) = \sum m(1, 3, 7, 11, 15) + \sum d(0, 2, 4)$

UNIT - II

3. (a) State and prove Division algorithm. **10**
   (b) Given a set S = {1, 2, 3, 4, 5}, find the equivalence relation on S which generated the partition $\{\overline{1,2}, \overline{3}, \overline{4,5}\}$. Draw the graph of the relation. **6**

OR

4. (a) State and explain the properties of the "Pigeonhole Principle". **6**
   (b) Prove that in a set of 16 children at least two have birthdays during the same month. **5**
   (c) Define Binary relation. Explain the properties of Binary relations. **5**

UNIT - III

5. (a) State and prove principles of inclusion-exclusion. **8**
   (b) How many arrangements are there for the word 'Mississippi' with no two pairs of consecutive same letters. **8**

OR

Contd...2

6. (a) Show that the generating function for the sequence $0^2, 1^2, 2^2, 3^2, \ldots$ is $\frac{x+1}{(1-x)^3}$. 8

(b) Determine the sequence generated by the following exponential generating functions. 8

(i) $f(x) = 5\,e^{5x}$

(ii) $f(x) = 2e^x + 3x^2$

UNIT - IV

7. (a) Solve the recurrence relation : 10

$2a_{n+3} = a_{n+2} + 2a_{n+1} - a_n$, $n \geq 0$

$a_0 = 0$, $a_1 = 1$, $a_2 = 2$

(b) Explain about divide and conquer algorithm. 6

OR

8. (a) Solve the recurrence relation $F_{n+2} = F_{n+1} + F_n$ where $n \geq 0$ and $F_0 = 0$, $F_1 = 1$. 10

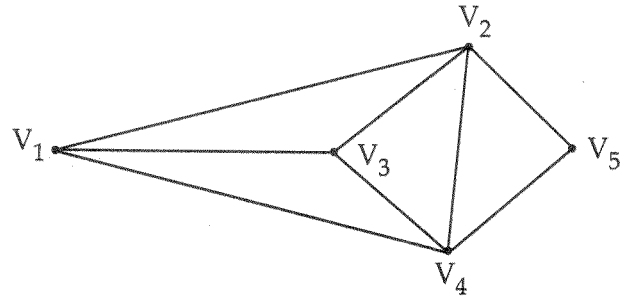
(b) Show that in a group (G, *) for every a, b $\in$ G, $(a * b)^2 = a^2 * b^2$ iff (G, *) is an abelian. 6

UNIT - V

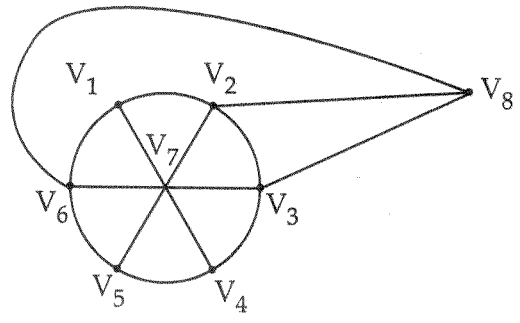
9. (a) When two graphs are said to be isomorphic ? Explain with an example. 8

(b) Find the chromatic number of the following graphs. 8

(i)



(ii)



OR

Contd...3

10. (a) Show that the complete Bipartite graph $K_{3,3}$ is non-planar. 6

(b) Prove that a complete graph K_n is planar, if and only if $n \leq 4$. 6

(c) What is minimal spanning tree ? Explain briefly . 4

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