

FACULTY OF INFORMATICS
B.E. 2/4 (IT) I Semester (New) (Main) Examination,
December 2011/January 2012
DISCRETE MATHEMATICS

Time : 3 Hours]

[Max. Marks : 75

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



PART – A

(25 Marks)

1. What are the contrapositive, the converse, and the inverse of the conditional statement – “If it snows today, I will ski tomorrow” ? 3
2. Construct the truth table for
 $(p \rightarrow q) \leftrightarrow (7q \rightarrow 7p)$ 2
3. A club has 25 members, how many ways are there to choose a president, vice President, Secretary and treasures of the club. 2
4. Use mathematical induction to prove that $n^3 - n$ is divisible by ‘3’ whenever ‘n’ is a positive. 3
5. In how many different ways can eight identical cookies be distributed among three distinct children if each child receives at least 2 cookies and no more than 4 cookies. 3
6. Solve the recurrence relation $a_n = 3a_{n-1} - 6a_{n-2}$. 2
7. Define poset with an example. 2
8. Define the following : 3
 - a) Complete graph
 - b) Cycle graph
9. Define minimum spanning tree. 2
10. Find the duals of $x(y+1)$ and $x\bar{z} + x.0 + \bar{x}.1$. 3

PART – B

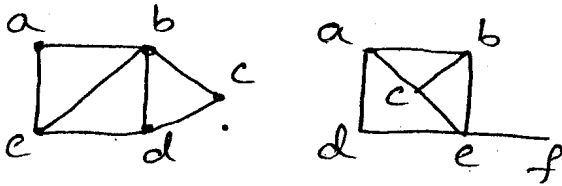
(50 Marks)

11. a) Explain about RSA encryption and Decryption algorithm. 6
- b) Convert the following into decimal and octal number system $(ABCDF)_{16}$. 4

12. a) Define binomial theorem and find the co-efficient $a^{17}b^{23}$ in the expansion of $(2a - 6b)^{40}$. 5
- b) Use mathematical induction to show that $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$ for all non-negative integer 'n'. 5

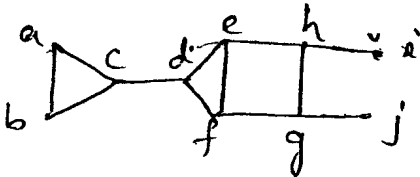
13. a) Using generating functions, show that $\sum_{k=0}^n (c(n, k))^2 = C(2n, n)$. 5
- b) Define mathematical expectation and variance of a random variable 'X'. A die is thrown. Let 'X' be the number appearing on the die. Find $E(x)$ and $V(x)$. 5

14. a) Define Hamilton circuit and Hamilton path. Find which of the following graph have Hamilton circuit or path or not having both 5



- b) Explain about Dijkstra's algorithm. 5

15. a) Use DFS to produce a spanning tree for the given graph 5



- b) Use K-maps to simplify the SOP form expression 5
- $$wx\bar{y}z + \bar{w}xyz + \bar{w}xy\bar{z} + \bar{w}xy\bar{z} + \bar{w}xy\bar{z} + \bar{w}xy\bar{z} + \bar{w}xy\bar{z}$$

16. a) Among the first 100 positive integers. Find the integers which are not divisible by 5, 7, or 9. 5
- b) Discuss the Kruskal's algorithm for a connected weighted graph with an example. 5

17. a) Find the number of integral solutions to $x_1 + x_2 + x_3 = 20$ where $2 \leq x_1 \leq 5$; $4 \leq x_2 \leq 7$; $-2 \leq x_3 \leq 9$. 5

- b) Find $f(n)$ where $n = 2^k$ where 'f' satisfies the recurrence relation $f(n) = 8f(n/2) + n^2$ with $f(1) = 1$. 5