

FACULTY OF INFORMATICS

B.E. 2/4 (IT) I – Semester (Main) Examination, Dec. 2014 / Jan. 2015

Subject: Discrete Mathematics

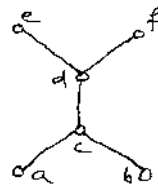
Time : 3 hours

Max. Marks : 75

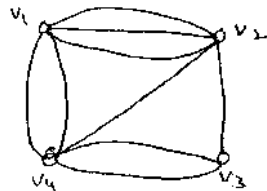
Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

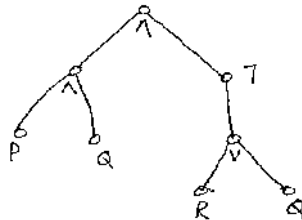
- 1 Define a biconditional statement. Construct the truth table for $\neg(P \vee Q)$. 3
- 2 Explain negation of quantified statement with one example. 2
- 3 State the pigeonhole principle. 2
- 4 In how many ways can a committee consisting of three men and two women be chosen from seven men and five women? 3
- 5 Suppose A and B are events with $P(A) = 0.6$, $P(B) = 0.3$ and $P(A \cap B) = 0.2$. Find the Probability that a) A or B occurs b) Neither A nor B occurs c) A does not occur 3
- 6 Define a disjunctive normal form. 2
- 7 Show that $\forall a \in B, a + a = a$ by Boolean algebra. 2
- 8 Define Lattice. Explain why the poset given below is not a Lattice. 3



- 9 Write the adjacency matrix of the following graph. 2



- 10 Define a Tree. Find the statement formula whose parsing tree is given below. 3



PART – B (50 Marks)

- 11 a) Show that the following is Tautology by using truth table. $(P \wedge (P \Rightarrow Q)) \rightarrow Q$ 5
- b) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q$, $Q \rightarrow R$, $P \rightarrow M$ and $\neg M$. 5

- 12 a) Obtain the principal conjunctive normal form of the formula $(\neg P \rightarrow R) \wedge (Q \Rightarrow P)$. 5
 b) Show that SVR is tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$. 5
- 13 a) Write an expression for 'a_r', where 'a_r' is the co-efficient of x^r in the generating function of $\left(\frac{1}{1-x} + \frac{5}{1+2x} + \frac{7}{1+x}\right)$. 5
 b) Let A, B, C, D denote Arts, Biology, Chemistry and Drama courses respectively. Find the number N of students in hostel in the given data. 5

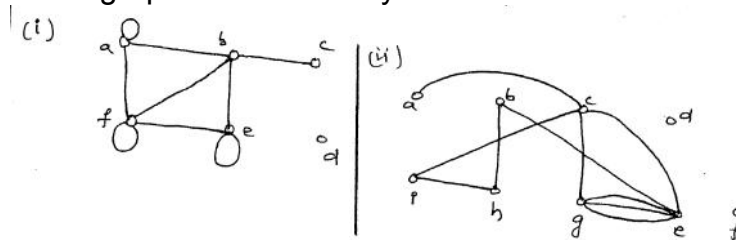
12 take A	5 take A and B	3 take A, B, C
20 take B	7 take A and C	2 take A, B, D
20 take C	4 take A and D	2 take B, C, D
8 take D	16 take B and C	3 take A, C, D
	4 take B and D	2 take all four
	3 take C and D	71 take none

- 14 a) A fair die is tossed. Let x denote twice the number appearing and let y be 1 or 3 according as an odd or even number appears. Find distribution and expected value of x and expected value of y. 5
 b) Solve $a_n - 7a_{n-1} + 12a_{n-2} = 57n + 2^n$ for $n \geq 2$ given that $a_0 = 0, a_1 = 1$. 5
- 15 a) Draw the graphs with the given adjacency matrix. 5

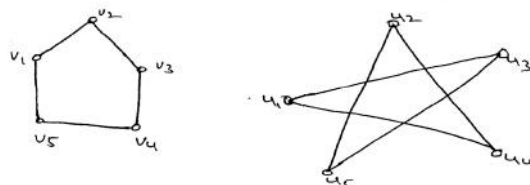
i)
$$\begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$

ii)
$$\begin{bmatrix} 1 & 2 & 0 & 1 \\ 2 & 0 & 3 & 0 \\ 0 & 3 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

- b) Find the number of vertices, the number of edges, degree of each vertex in the given undirected graphs. Also identify the isolated vertices if any. 5



- 16 a) Determine whether the given pair of graphs is isomorphic. 5



- b) Let $f(x, y, z) = x\bar{y} + xy\bar{z} + \bar{x}y\bar{z}$. Show that 5
 i) $f(x, y, z) + x\bar{z} = f(x, y, z)$ ii) $f(x, y, z) + x \neq f(x, y, z)$

- 17 What do you mean by "spanning tree"? Explain the DFS method for finding a spanning tree with the help of an example. 10