

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- May 2018

B. Tech. II Semester (CSE, ECE, IT)

COURSE CODE: 10B11MA211

MAX. MARKS: 35

COURSE NAME: DISCRETE MATHEMATICS

COURSE CREDITS: 4

MAX. TIME: 2 Hrs

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. [CO1] (a) 40 computer programmers interviewed for a job. 25 knew Java, 28 knew Oracle and 7 knew neither language. How many knew both languages? [2]

(b) Using Mathematical Induction, show that $\frac{1^2}{1.3} + \frac{2^2}{3.5} + \dots + \frac{n^2}{(2n-1)(2n+1)} = \frac{n(n+1)}{2(2n+1)}$. [3]

2. [CO2] (a) Let $P = \{2,3,4,5\}$. Consider the relation R and S on P defined by [2]

$R = \{(2,2), (2,3), (2,4), (2,5), (3,4), (3,5), (4,5), (5,3)\}$.

$S = \{(2,3), (2,5), (3,4), (3,5), (4,2), (4,3), (4,5), (5,2), (5,5)\}$.

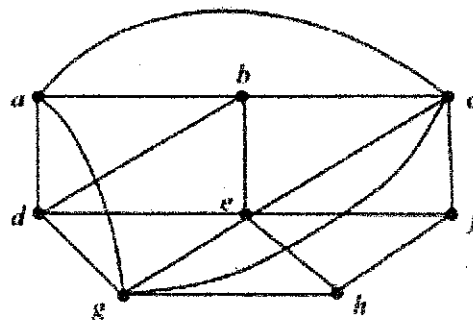
Find the matrices of above relations and use these matrices to find the compositions RoS, SoR

(b) Using generating function, solve the following recurrence relation [3]

$a_{r+2} - 2a_{r+1} + a_r = 2^r$ with initial conditions $a_0 = 2$ and $a_1 = 1$.

3. [CO 3] (a) Define diameter of a graph. What is the diameter of Q_3 graph? [2]

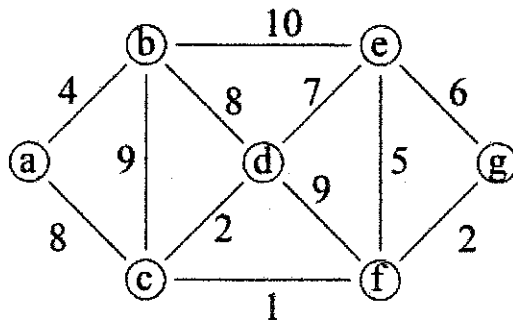
(b) Using Welsh Powell algorithm find an upper bound for the chromatic number of the following graph: [3]



4. [CO 3] (a) Justify whether K_6 is a planar graph or not? [2]

[PTO]

(b) Using Prim's algorithm, find a minimum spanning tree, and its total weight for the following connected weighted graph: [3]



5. [CO5] (a) Define a commutative ring and give an example of a non-commutative ring. [2]
 (b) Considering the operation of multiplication modulo 5, construct a set of residue classes Z_5 . Show that (Z_5, \times_5) is an abelian group. Also find the inverses of each and every element. [3]
6. [CO 4] (a) Investigate whether $(D_{60}, |)$ is a Boolean algebra or not? Justify your answer. [2]
 (b) Let $A = \{\phi, 1, 2\}$. Draw the Hasse Diagram of the poset $(P(A), \subset)$. Also show that $(P(A), \subset)$ is a bounded, distributive and complemented lattice by explaining in detail. [3]
7. [CO 6] (a) Find language of the following grammar: [2]
 $V = \{S, A, a, b\}$, where the set of terminals $T = \{a, b\}$, starting symbol is S and production rules are given by $P = \{S \rightarrow aA, S \rightarrow b, A \rightarrow aa\}$.
- (b) Define a FSM with outputs and construct the state diagram for the finite state machine with the state table given below: [3]

State	f		g	
	Input		Output	
	0	1	0	1
s_0	s_0	s_4	1	1
s_1	s_0	s_3	0	1
s_2	s_0	s_2	0	0
s_3	s_1	s_1	1	1
s_4	s_1	s_0	1	0
