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SUBJECT CODE NO:- H_1211
FACULTY OF SCIENCE AND TECHNOLOGY
S.Y.B.Tech. (CSE) (Sem- III)
Discrete Mathematics
[Revised]

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

N.B

Please check whether you have got the right question paper.

- 1) Q.No.1 and Q.No.6 are compulsory.
- 2) Solve any two questions from question 2 to 5 any two questions from questions 7 to 10.

Section A

- Q.1 Attempt any five: 10
- i) Which of these sentences are propositions? What are the truth values of those that are propositions?
 - a) There is no pollution in Delhi
 - b) $2 + 1 = 5$
 - ii) How many rows appear in a truth table for each of these compound propositions?
 - a) $(PV \sim t) \wedge (PV \sim S)$
 - b) $P \wedge \sim P$
 - iii) State the pigeonhole principle.
 - iv) List the ordered pairs in the relation R from $A = \{0,1,2,3,4\}$ to $B = \{0,1,2,3\}$ where $(a,b) \in R$ if and only if $a > b$.
 - v) Define recurrence relation.
 - vi) State the equation of the linear recurrence relation with constant coefficient of order k.
- Q.2 a) Using mathematical induction prove that- 07
- $$1.2 + 2.3 + \dots + n(n+1) = \frac{n(n+1)(n+2)}{3}$$
- b) Among the integers 1 to 1000, how many of them are not divisible by 3, nor by 5, nor by 7. 08
- Q.3 a) Find the inverse of the functions 08
- i) $f(x) = \frac{x+1}{x}$
 - ii) $f(x) = \sqrt[3]{x-2}$
- b) Suppose that the relations R_1 and R_2 on a set A are represented by the matrices.

$$M_{R_1} = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} \text{ and } M_{R_2} = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

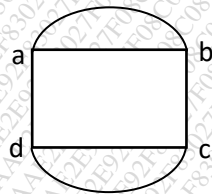
What are the matrices representing

- i) $R_1 \cup R_2$
- ii) $R_1 \cap R_2$

- Q.4 a) Find the total solution of $a_r - ga_{r-1} + 18a_{r-2} = 0$ with $a_0 = 1, a_1 = 4$ 07
- b) Solve $a_r - 3a_r - 1 = 2, r \geq 1$ with $a_0 = 1$ using generating functions. 08
- Q.5 a) Let $A = \{2, 3, 4, 6\}$ and let aRb if a divides b . Show that R is a partial order and draw its Hasse diagram. 07
- b) Show that $(p \rightarrow r) \vee (q \rightarrow r)$ and $(p \wedge q) \rightarrow r$ are logically equivalent. 08

Section B

- Q.6 Attempt any five: 10
- i) Find the value of $P(8, 8)$
 - ii) What is the expansion using binomial theorem of $(x + y)^2$
 - iii) What is an algebraic system
 - iv) Define monoid
 - v) What is the chromatic number of K_n ?
 - vi) State whether the following graph is planar or not.



- Q.7 a) Generate all the permutations of $\{1, 2, 3, 4\}$ 07
- b) Suppose that repetitions are not permitted, 08
- i) How many 4 digit numbers can be formed from the six digits 1, 2, 3, 5, 7, 8?
 - ii) How many such numbers are less than 4000?
 - iii) How many of the numbers in (i) are even?
 - iv) How many of the numbers in (ii) are odd?
- Q.8 a) Find the next larger permutation in lexicographic order after each of these permutations. 08
- i) 2134
 - ii) 12453
 - iii) 3142

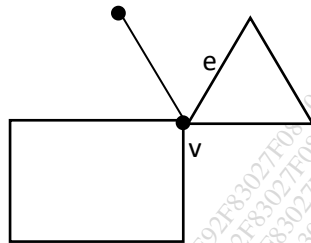
iv) 45321

b) Explain with example.

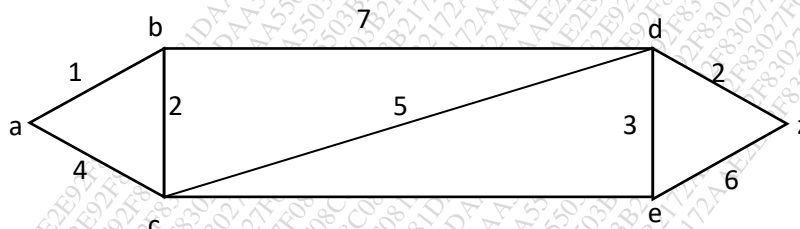
- Factors of a graph
- Complement of a graph
- Multi graph
- Regular graph

07

Q.9 a) Find $(G-v)$ and $(G-e)$ from the following graph. 07



b) Apply Dijkstra's shortest path algorithm to find the shortest path between vertices a and z in the figure below. 08



Q.10 a) Let $(A, *)$ be an algebraic system such that for all $a, b \in A$ 07

$$(a * b) * a = a$$

$$(a * b) * b = (b * a) * a$$

- Show that $a * (a * b) = a * b$, for all $a, b \in A$
- Show that $a * a = (a * b) * (a * b)$, for all $a, b \in A$

b) Let $(\{a, b\}, *)$ be a semi group where

$$a * a = b \text{ show that}$$

- $a * b = b * a$
- $b * b = b$

08