R17 Regulation

Subject code: 1P3EC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

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MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(CSE & IT)

Maximum Marks: 70 Date: 17.03.3021 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks **(10x2M=20 Marks)**

1 Prove $P \vee Q \Leftrightarrow \neg(\neg P \wedge \neg Q)$.

2 Write the following statements in symbolic form:
(i). Something is good
(ii). Everything is good
(iii). Nothing is good
(iv). Something is not good.

3 Define PO-set with an example.

4 Define Permutation.

5 List Some Properties of Lattice.

6 Let the relation $R = \{(1, 2), (2, 3), (3, 3)\}$ on the set $\{1, 2, 3\}$. What is the transitive closure of R?

7 The operation $\circ$ is defined by $a \circ b = a + b - ab$ for all $a, b \in Z$. Show that $(Z, \circ)$ is a semi group.

8 Define a Group with example.

9 Let $X = \{1, 2, 3, 4\}$ and $R = \{(x, y) | x > y\}$. Draw the graph of R and also give its matrix.

10 Let the compatibility relation on a set $\{x1, x2, ..., x6\}$ be given by the matrix:

x2	1				
x3	1	1			
x4	0	0	1		
x5	0	0	1	1	
x6	1	0	1	0	1
	x1	x2	x3	x4	x5

Draw the graph and find the maximal compatibility blocks of the relation.

Part-B

Answer All the following questions. **(10M X 5=50Marks)**

11 a)Obtain the principal disjunctive normal form of $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$. (5M)

b) Obtain the principal conjunctive normal form of the formula $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$ (5M)

OR

12 Establish the validity of the following argument:"All integers are rational numbers. Some integers are powers of 2. Therefore, some rational numbers are powers of 2". (10M)

13 Explain Pigeon hole principle and its application. (10M)

OR

14 Solve the recurrence relation $a_n+5a_{n-1}+6a_{n-2}=3n^2 \forall n\geq 2$ and $a_0=a_1=0$. (10M)

15 Consider the following recursive function definition: If $x < y$ then $f(x, y) = 0$, if $y \leq x$ then $f(x, y) = f(x - y, y) + 1$. Find the value of $f(4, 7), f(19, 6)$. (10M)

OR

16 Let A be a finite set and $\rho(A)$ be its power set. Let $\subseteq$ be the inclusion relation on the elements of $\rho(A)$. Draw the Hasse diagram of $\rho(A), \subseteq)$ for

a) $A = \{a\}$ b) $A = \{a, b\}$. (10M)

17 Prove that $G = \{1, \omega, \omega^2\}$ is a group with respect to multiplication where $1, \omega, \omega^2$ are cube roots of unity. (10M)

OR

18 a)Show that set $G = \{x | x = 2^a 3^b$ for $a, b \in Z\}$ is a group under multiplication. (5M)

b)If every element of a group G is its own inverse, show that G is an abelian group. (5M)

19 Define Euler graph, Hamiltonian circuits and paths. (10M)

OR

20 a) Explain Graph theory and its applications. (5M)

b) Define Isomorphism with examples. (5M)