R18 Regulation Subject code: 2B4EA

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

## B.Tech IV Semester Supplementary Examinations, September 2023

## Discrete Mathematics

*(Common to CSE & IT Department)*

***Maximum Marks: 70*** Date:13.09.2023 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 If A = {1,2,3,4,5,6,7,8,9,10,11,12} and R= { (x,y)/x-y is multiple of 5} find the partition of A
2 Find the inverse of the function f(x) = $e^x$ defined from R to $R^+$.
3 Define Fibonacci numbers recursively
4 Explain with an example of pair wise relatively primes
5 Construct the truth table of (PVQ) $\rightarrow$ P
6 Write a short notes on DNF and CNF
7 If aob=a+b+ab$\forall$ a,b$\in$Z S.T (Z,0) is a semi group.
8 If a, b $\in$ group G, then prove that $(ab)^{-1}$ =$b^{-1}$ $a^{-1}$
9 Define complete bipartite graph with example
10 Draw $K_5$ complete graph

## Part-B

Answer All the following questions. (5X10M=50Marks)

11 a) Draw the Hasse diagram representing the positive divisors of 36. (5M)
b) Show that the relation 'R' defined by (a,b) R (c,d) iff a+d=b+c is an equivalence relation.(5M)

OR

12 a) Let X={1,2,3,4,5,} and relation R={(x,y)/x>y}.Draw the graph of 'R' and also give its matrix. (5M)
b) What is Compatibility relation and Write the procedure to find compatibility blocks. (5M)

13 a) Use Mathematical Induction to show that $1+2+2^2+2^3+\cdots\ldots\ldots\ldots+2^n = 2^{n+1}-1$ (5M)
b) Write the Procedure for Euclidean algorithm to find gcd of two numbers (5M)

OR

14 State and Prove Division algorithm theorem using well ordering principle. (10M)

15 a) Obtain CNF of $((P \rightarrow Q) \wedge \sim Q) \rightarrow \sim P$ (5M)
b) Obtain DNF of $(Q \rightarrow P) \wedge (\sim P \wedge Q)$ (5M)

OR

16 a) Show that the following set of premises are inconsistent (5M)

$P \rightarrow Q, P \rightarrow R, Q \rightarrow \sim R, P$

b) Check the validity of the following argument (5M)

All integers are rational numbers

Some integers are powers of 5

Therefore, some rational numbers are powers of 5.

17 a) Show that $Q_1$ (rational numbers other than1) is an infinite abelian group with respect to * defined by a*b=a+b-ab, where a,b are rational number (5M)

b) Prove that the identity element of a group "G' is same as identity element of its subgroup H. (5M)

OR

18 a) Prove that in a group its identity element, inverse element are unique. (5M)

b) State and prove Lagrange's theorem on cosets. (5M)

19 a) Define dual and Isomorphism of graphs with example. (5M)

b) State and prove fundamental theorem of graph theory. (5M)

OR

20 Explain Eulerian and Hamiltonian graphs with examples, also draw the graphs of the following

i) Eulerian but not Hamiltonian (5M)

ii) Hamiltonian but not Eulerian (5M)