*R20 Regulation* *Subject code: 3B3EB*

**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY**

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

# B.Tech III Semester Supplementary Examinations, July 2022

## MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

*(Common to CSE & IT)*

*Maximum Marks: 70* Date:21.07.2022 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 Construct the truth table of (PVQ) $\rightarrow$ P
2 Write a short notes on DNF
3 Write the rule of modus tollens of predicates
4 Express the statement in words: "Every student in class has studied Calculus." Using quantifiers.
5 Explain about Mathematical Induction
6 Explain with an example of pair wise relatively primes
7 Let R= { [1,1] [2,2] [3,3] [4,4] [5,5] [1,2] [2,1] [5,4] [4,5]} be the equivalence relation on A = {1,2,3,4,5} Find equivalence classes and A/R
8 Find the inverse of the function f(x) = $e^x$ defined from R to $R^+$
9 Show that binary operation * defined on (R,*) where $x*y=x^y$ is not associative.
10 Define a) Normal subgroup of a group b) Quotient group

## Part-B

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

11 Prove that for any three propositions P,Q,R the compound proposition $((P \rightarrow (Q \rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R))$ is a tautology by
*i*) with truth table ii) with laws of logic [5+5]

OR

12 a)Find PDNF by constructing the PCNF of (Q v P)$\wedge$ (QVR)$\wedge$ (~ (PV R) V ~Q)) [5]
b) Show using truth table that the statements ( p $\rightarrow$ q) and (~ p V q ) are logically equivalent. [5]

13 Test for validity of the following argument
" No Engineering student is bad in studies "
"Anil is not bad in studies"
Therefore " Anil is an engineering student" [10]

OR

14 Is the following Conclusion valid derive from contradiction method with the premises ~*q*, p$\rightarrow$q, p V t with the conclusion t. [10]

15 Use Mathematical Induction to prove the following generalization of one of Demorgan's laws

$(\cap_{j=1}^{n} A_j)' = \cup_{j=1}^{n} A_j'$ where $A_1, A_2, A_3, \ldots\ldots A_n$ are subsets of universal set U. [10]

OR

16 State and Prove Division algorithm theorem using well ordering principle. [10]

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

OR

18 Let A = B = $\{x / -1 \leq x \leq 1\}$ for each of the following functions state whether it is injective, surjective or bijective

a) f(x) = IxI b) g(x) = sinπx c) h(x) = $\frac{2x+3}{5}$ [3+3+4]

19 a) Show that the fourth roots of unity form a group with respect to multiplication. [5]
b) Prove that the identity element of a group "G' is same as identity elements of its subgroup H. [5]

OR

20 a) If 'G' is a group then prove that $(a^{-1})^{-1}=a$. [5]
b) Prove that G ={0,1,2,3,4} is an abelian group of order 5 with respect to addition modulo 5. [5]