



TKRCET
HYDERABAD
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R22 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code: 4E3EC

B.Tech III Semester Regular Examinations, February 2024
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(Common to CSE & CSE(AI&ML))

Maximum Marks: 60

Date: 23.02.2024 Duration: 3 hours

- Note: 1. This question paper contains two parts A and B.
2. Part A is compulsory which carries 10 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		CO	Bloom Tx
All the following questions carry equal marks (10x1M=10 Marks)			
1.a)	Define wellformed Formula	CO1	L1
b)	Write the sentence "It is not true that all roads lead to Rome" in the symbolic form?	CO1	L1
c)	Verify whether the following inference is valid or not Statement 1: If today is 2nd October then today is Gandhi's birthday. Statement 2 : Today is not 2nd October Inference : Today is not Gandhi's birthday	CO2	L1
d)	Provide a proof by contradiction of the following statement "For every integer n, if n ² is odd then n is odd".	CO2	L1
e)	Find GCD (2735, 572).	CO3	L1
f)	Define recursion with an example..	CO3	L1
g)	Find the transitive closure of the relation $R=\{(1,1),(1,2),(1,3),(2,3),(3,1)\}$ defined over a set $S=\{1,2,3\}$.	CO4	L1
h)	Draw the Hasse diagram for the divisibility on the set $\{1,2,3,6,12,24,36,48,96\}$	CO4	L2
i)	Define Abelian Group.	CO5	L1
j)	What is a congruence relation?	CO5	L1
Part-B			
Answer All the following questions. (5X10M=50Marks)			Bloom Tx
2	a. Construct the principal disjunctive normal form of the following formula : $P \vee (\neg P \rightarrow (Q \vee (\neg Q \rightarrow R)))$ [5M] b. Construct PCNF and PDNF by using truth table for the formula $(P \rightarrow Q) \vee (Q \leftrightarrow R)$ [5M]	CO1	L3
OR			
3	a) Show that $S \vee R$ is tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$ [5M] b. Show that $\forall x (P(x) \rightarrow Q(x)) \wedge \forall x (Q(x) \rightarrow R(x)) \Rightarrow \forall x (P(x) \rightarrow R(x))$ [5M]	CO1	L3

4	a. Test the validity of the argument $\exists x(P(x) \wedge S(x)), \forall x(P(x) \rightarrow R(x)) \Rightarrow \exists x(R(x) \wedge S(x))$ [5M] b. Show that $\sim p$ follows from the set of premises $(r \rightarrow \sim q), r \vee s, s \rightarrow \sim q, p \rightarrow q$ using indirect method of proof. [5M]	CO2	L4
OR			
5	a. Show that $P \rightarrow S$ implied by $\neg P \vee Q, \neg Q \vee R, R \rightarrow S$ by using rules of inferences. [5M] b. Solve that the following argument is valid: No engineers are fools. No one who is not a fool is an administrator. Kumar is an engineer. Therefore Kumar is not an administrator. [5M]	CO2	L3
6	a. Apply the Division Algorithm with appropriate example? [5M] b. Demonstrate the recursion theorem for factorial and Fibonacci sequence? [5M]	CO3	L3
OR			
7	a. Explain in brief the well ordering principle? Comment on any five defined sets? [5M] b. Illustrate the Euclidean Algorithm for finding GCD of two numbers. [5M]	CO3	L2
8	a. What is Equivalence relation? Prove that $R = \{(1,1), (1,2), (2,1), (2,2), (3,3), (3,4), (4,3), (4,4), (5,5), (5,6), (6,5), (6,6)\}$ is Equivalence relation. [5M] b. Draw Hasse diagram for factors of 210. [5M]	CO4	L5
OR			
9	a. Let $A = \{1,2,3,4\}$, $B = \{a,b,c,d\}$ and $C = \{x,y,z\}$. Consider the function $f: A \rightarrow B$ and $g: B \rightarrow C$ defined by $f = \{(1,a), (2,c), (3,b), (4,a)\}$ and $g = \{(a,x), (b,x), (c,y), (d,y)\}$. build the composition function $(g \circ f)$. [5M] b. Let $f: R \rightarrow R$ be given by $f(x) = x^3 - 2$. Find f^{-1}. [5M]	CO4	L3
10	a. On the set Q of all rational numbers, the operation $*$ is defined by $a * b = a + b - ab$. Prove that, under this operation, Q forms a commutative monoid. [5M] b. Show that the set of all roots of the equation $x^4 = 1$ forms a group under multiplication. [5M]	CO5	L5
OR			
11	a. State and prove Lagrange's theorem on cosets. [5M] b. State and Explain the Properties of Algebraic System. [5M]	CO5	L5