



R22 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code:4E3EC

B.Tech III Semester Regular/Supplementary Examinations, December 2024

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

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

Maximum Marks: 60

Date:09.12.2024

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 Tautology and give an example.	1	L1
b)	Write the absorption laws.	1	L1
c)	Define the existential quantifier with suitable example.	2	L1
d)	Find the negation of $(\exists x \in D)(x + 2 = 7)$ where $D = \{1,2,3,4\}$	2	L1
e)	Show that 131 is a prime number.	3	L2
f)	Define recursion with an example.	3	L1
g)	Represent the relation $R = \{(1,1), (1,2), (2,1), (2,2), (3,4), (4,1)\}$ by a digraph.	4	L2
h)	Define partial ordered relation.	4	L1
i)	Define Normal group of a group G.	5	L1
j)	Define monoid.	5	L1
Part-B		CO	Bloom Tx
Answer All the following questions. (5X10M=50Marks)			
2	A) Obtain PDNF by constructing PCNF of $PV(\sim P \rightarrow (QV(\sim Q \rightarrow R)))$ using laws of logic. (6M)	1	L3
	B) Apply the truth table to show that the proposition $(P \rightarrow Q) \rightarrow (P \wedge Q)$ is a contingency. (4M)	1	L3
OR			
3	A) Identify $P \rightarrow (Q \wedge R)$ and $\sim PV(Q \wedge R)$ are logically equivalent by using truth tables. (6M)	1	L3
	B) Construct the truth table of "If tigers have wings then the earth travels round the sun". (4M)	1	L3
4	A) Test the validity of the following argument. If I study, I will not fail in the examination. If I do not watch TV in the evenings, I will study. I failed in the examination. Therefore, I must have watched TV in the evenings. (5M)	2	L4

	B) Use indirect method to prove that that $\forall x(P(x) \vee Q(x))$ and $((\forall x) \sim P(x))$ with conclusion is $(\exists x)Q(x)$. (5M)	2	L4
	OR		
5	Analyze and show that $(P \rightarrow Q) \wedge (R \rightarrow S), (Q \wedge M) \wedge (S \rightarrow N), \sim(M \wedge N)$ and $(P \rightarrow R) \Rightarrow \sim P$ (10M)	2	L4
6	A) Discover the gcd of 595 and 252 and express it in the form of $252m + 595n$ (6M)	3	L4
	B) If $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$ then analyze and show that $ac \equiv bd \pmod{m}$ (4M)	3	L4
	OR		
7	Analyze and prove that $7^{n+2} + 8^{2n+1}$ is divisible by 54 for each non-negative integer n. (10M)	3	L4
8	A) Analyze and show that the relation $R = \{(a,a), (a,b), (b,a), (b,b), (c,c)\}$ on $A = \{a,b,c\}$ is an equivalence relation and find A/R also find partitions. (6M)	4	L4
	B) Draw the Hasse diagram representing the positive divisors of 36 (4M)	4	L4
	OR		
9	A) Prove that a function $f: R \rightarrow R$ defined by $f(x) = 3x - 7$ is a bijective. (4M)	4	L4
	B) If $X = \{1,2,3,4\}$ and $R = \{(x,y) / x < y\}$. Draw the graph of 'R' and also give its matrix also explain the properties of relation. (6M)	4	L4
10	A) Analyze and show that in a group G for $a, b \in G, (ab)^2 = a^2b^2 \Leftrightarrow G$ is an abelian. (5M)	5	L4
	B) Explain the set of all cube roots of unity is a cyclic group with respect to multiplication. (5M)	5	L4
	OR		
11	A) Analyze and prove that the set $G = \{1,2,3,4,5,6\}$ is a finite abelian group of order 6 with respect to multiplication modulo 7. (5M)	5	L4
	B) Analyze and prove that the order of a subgroup of a finite group divides the order of a group. (5M)	5	L4