



B.Tech III Semester Supplementary Examinations, July 2024

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to CSE & IT)

Maximum Marks: 70

Date: 20.07.2024 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 which carries 10M.
 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)	CO	Bloom Tx
1	Construct the truth table of $(PVQ) \rightarrow P$		1	L1
2	Write a short notes on DNF		1	L1
3	Write the rule of Modus Ponens of predicates.		2	L1
4	Write the rule of disjunctive amplification of predicates.		2	L1
5	Explain about Mathematical Induction		3	L1
6	Write the properties of gcd		3	L1
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		4	L1
8	Let $f(x)=x+2$ $g(x) = x-2$, $h(x) = 3x$ find i) $f \circ g$ ii) $f \circ g \circ h$.		4	L1
9	If $a, b \in$ group G , then prove that $(ab)^{-1} = b^{-1} a^{-1}$		5	L1
10	Define a) Left coset of subgroup H in G . b) Right coset of subgroup H in G .		5	L1

Part-B

Answer All the following questions.		(5X10M=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	(10M)	1	L2
OR				
12	a) Write the procedure of PDNF. (5M) b) Write the procedure of PCNF. (5M)		1	L2
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"	(10M)	2	L2
OR				

14	Show that the following set of premises are inconsistent (10M) $P \rightarrow Q, P \rightarrow R, Q \rightarrow \sim R, P$	2	L2
15	a) Prove that there are infinitely many primes. (5M) b) Define modular arithmetic? Prove that the integers a,b are congruent modulo m iff there is an integer k such that $a \equiv b \pmod{m}$, where m is a positive integer. (5M)	3	L2
OR			
16	a) Use Mathematical Induction to show that $1+2+2^2 + 2^3 + \dots + 2^n = 2^{n+1} - 1$ (5M) b) Write the Procedure for Euclidean algorithm to find gcd of two numbers (5M)	3	L2
17	a) 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 of A (5M) b) Let $f: R \rightarrow R, g: R \rightarrow R$, where R is the set of real numbers be given by $f(x) = x^2 - 2$ and $g(x) = x+4$ find $f \circ g$ and $g \circ f$. state whether these functions are bijective or not (5M)	4	L2
OR			
18	a) Prove that the relation R defined by “a is congruent to b modulo m” on the set of integers is an equivalence relation. (5M) b) Draw the Hasse diagram representing the positive divisors of 45. (5M)	4	L2
19	Construct composition table for the roots of equation $x^4 = 1$ and Show that it is a group with respect to operation multiplication. (10M)	5	L2
OR			
20	a) If ‘G’ is a group then prove that $(a^{-1})^{-1} = a$ (5M) b) Prove that $G = \{0,1,2,3,4\}$ is an abelian group of order 5 with respect to addition modulo 5. (5M)	5	L2