



B.Tech III Semester Supplementary Examinations, December 2024

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

Maximum Marks: 70

Date:04.12.2024

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	If p : A circle is a conic, q : 5 is a real number, r : Exponential series is convergent. Express the compound propositions $p \rightarrow (q \vee r)$, $p \wedge (\sim q)$ in words.	1	L1
3	Write the rule of disjunctive amplification of predicates	2	L1
4	Write the rule of conjunctive simplification of predicates.	2	L1
5	Define Fibonacci numbers recursively.	3	L1
6	Write the properties of gcd?	3	L1
7	If R is a relation on the set $A = \{1, 2, 3, 4\}$ defined by $x R y$ if x exactly divides y . Prove that (A, R) is a poset.	4	L1
8	Let f and g be functions from R to R defined by $f(x) = ax + b$, $g(x) = 1 - x + x^2$. If $(g \circ f) = 9x^2 - 9x + 3$, determine a, b	4	L1
9	Show that the cube roots of unity form a group with respect to multiplication.	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)		CO	Bloom Tx
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	Find the PDNF of [10M] $(P \rightarrow Q) \wedge (P \rightarrow R) \vee (Q \rightarrow \sim R)$	1	L2
13	Test for validity of the following argument [10M] "No Engineering student is bad in studies" "Anil is not bad in studies" Therefore "Anil is an engineering student"	2	L2

	OR		
14	Show that the following set of premises are inconsistent $P \rightarrow Q, P \rightarrow R, Q \rightarrow \sim R, P$ [10M]	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 $a=b+km$, 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 Hassediagram 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