Q. Code: 410583

Reg. No. | | | | | | | | | | | | | |

B.E./ B. TECH.DEGREE EXAMINATIONS, MAY 2024

Second Semester

MA22253 - MATHEMATICS FOR DATA SCIENCE

(Artificial Intelligence and Data Science)

(Regulation 2022)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO1	Perform operations on various discrete structures such as sets, functions and relations.	**3**
CO2	Test the logic of a programme, having acquired knowledge of the necessary concepts.	**3**
CO3	Identify structures on many levels as an application of the concepts and properties of algebraic structures.	**3**
CO4	Apply the basic notions of groups, rings, fields which will be used to solve related problems.	**3**
CO5	Execute the simplification of Boolean algebraic expression.	**3**

PART- A(20x2=40Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Evaluate $\{1,2\}\times\{a,b,c\}$ & $\{a,b,c\}\times\{1,2\}\}$. Are they equal?	**1**	**2**
2.	Let $A=\{a,b,c\}$ and $B=\{b,c,d\}$. Find $A\oplus B$.	**1**	**2**
3.	Let $A=\{a_1,a_2,a_3\}$ and $B=\{b_1,b_2,b_3,b_4\}$.Which ordered pairs are in the relation R represented by the matrix $M_R=\begin{bmatrix}0&1&0&0\\1&0&1&1\\1&0&1&0\end{bmatrix}$	**1**	**2**
4.	Let $X=\{1,2,3,4\}$ & $R:X\to X$ be given by $R=\{(1,2),(2,3),(3,4),(4,1)\}$. Form the composition function f^2.	**1**	**2**
5.	Verify the statement $(P\vee Q)\to P$ is a tautology.	**2**	**2**
6.	Negate the statement "For all real number x, if x>3 then $x^2>9$".	**2**	**2**
7.	Write the converse and contra-positive of the conditional statement 'If there is a will, then there is a way'.	**2**	**2**
8.	Express the premises in symbolic form "Every student in this school is good at studies"	**2**	**2**
9.	Find the inverse of 2 in the group{0,1,2,3} under multiplication mod 4.	**3**	**2**
10.	Find the order of [2] and [4] in $(Z_8,+_8)$	**3**	**2**
11.	Verify that $f:(G,+)\to(G',x)$ defined by $f(a)=2^a\ \ \forall a\in R$ is a homomorphism.	**3**	**2**
12.	Check whether the permutation $f=\begin{pmatrix}1&2&3&4\\4&3&1&2\end{pmatrix}$ is odd or even?	**3**	**2**
13.	What is the degree of the polynomial $f(x)=8x^3+6x^2+4x-8$ over Z_4	**4**	**2**
14.	What is the remainder when $f(x)=2x^3+3x^2+x+2\in Z_6[x]$ is divided by $x-2$	**4**	**2**
15.	Is x^2-4 over Q irreducible? Find the roots of the polynomial over field Q.	**4**	**2**
16.	What are the units in the ring(Z, +, x)	**4**	**2**
17.	Determine whether the poset ({1,2,3,4,6,8,12,24},/) is a Lattice.	**5**	**2**
18.	What are the atoms of $\{S_{36}, \mid\}$	**5**	**2**
19.	Write the Demorgan's law for a Boolean algebra.	**5**	**2**
20.	Evaluate the expression $X=a\,\overline{[(b+c)+\overline{d}]}$ for a=0.b=0,c=1,d=1.	**5**	**2**

PART- B (5x 10=50Marks)

Q.No.	Question	Marks	CO	RBT LEVEL
21 (a)	If the relation R and S is given by $P=\{(1,2),(2,4),(3,3)\}$, $Q=\{(1,3),(2,4),(4,2),(4,2)\}$ find $(i)P\cup Q\ (ii)P\cap Q(iii)P-Q\ (iv)Q-P(v)P\oplus Q$. Also verify that $D(P\cup Q)=D(P)\cup D(Q)$ & $R(P\cap Q)\subseteq R(P)\cap R(Q)$	**(10)**	**1**	**3**
	(OR)			
(b)	Let $f(x)=x+2, g(x)=x-3, h(x)=2x \quad \forall x\in R$.Where R is the set of real numbers. Find $f\circ g, g\circ f, f\circ f, g\circ g, f\circ h, g\circ h, h\circ g, h\circ f, f\circ g\circ h, h\circ g\circ f$	**(10)**	**1**	**3**
22.(a)	Obtain the PDNF and PCNF of the statement $(p\to(q\wedge r))\wedge(\neg p\to(\neg q\wedge r))$	**(10)**	**2**	**3**
	(OR)			
(b)	Show that S is a valid inference from the premises $P\to\neg Q, Q\wedge R, \neg S\to P$ and $\neg R$	**(10)**	**2**	**3**
23. (a)	Show that (Z,*) is a group where $a*b=a+b+1$.	**(10)**	**3**	**3**
	(OR)			
(b)	Determine $(i)\ \alpha\beta\ \ (ii)\ \alpha^{-1}\ and\ \beta^{-1}\ (iii)\ (\alpha\beta)^{-1}\ (iv)(\beta\alpha)^{-1}(v)O(\alpha\beta)$ In a group S_5={1,2,3,4,5} where $\alpha=\begin{pmatrix}1&2&3&4&5\\2&3&1&4&5\end{pmatrix}$ & $\beta=\begin{pmatrix}1&2&3&4&5\\2&1&5&3&4\end{pmatrix}$	**(10)**	**3**	**3**
24. (a)	Find $[100]^{-1}$ in the ring Z_{1009}.	**(10)**	**4**	**3**
	(OR)			
(b)	If $f(x)=3x^2+4x+2\in Z_7[x], g(x)=6x^4+4x^3+5x^2+3x+1\in Z_7[x]$, then q(x) and r(x}, when g(x) is divided by f(x).	**(10)**	**4**	**3**
25. (a)	Let S_{42} be the set of positive divisors of 42. If ≤ is the relation of divisibility, prove that (S_{42}, ≤) is a Poset. Draw the Hasse diagram of the Poset.	**(10)**	**5**	**3**
	(OR)			
(b)	Let B = {1,2,3,5,6,15,30}, be the divisors of 30 with the divisibility as order. For any $a,b\in B,\ a+b=lcm(a,b),\ \ a.b=\gcd(a,b),\ \ a'=\frac{30}{a}$, Verify that $(B,+,\ .\ ,',\ 1,30)$ is a Boolean Algebra.	**(10)**	**5**	**3**

PART- C (1x 10=10Marks)

(Q.No.26 is compulsory)

Q.No.	Question	Marks	CO	RBT LEVEL
26.	Prove the equivalence $\neg p\to(q\to r)\Leftrightarrow q\to(p\vee r)$	**(10)**	**2**	**3**

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