



23104691

QP CODE: 23104691

Reg No : .....

Name : .....

**B.Sc DEGREE (CBCS) REGULAR/IMPROVEMENT/REAPPEARANCE  
EXAMINATIONS, FEBRUARY 2023**

**First Semester**

**Core Course - MM1CRT01 - FOUNDATION OF MATHEMATICS**

(Common to B.Sc Mathematics Model I, B.Sc Mathematics Model II Computer Science, B.Sc  
Computer Applications Model III Triple Main)

2017 Admission Onwards

C789FB92

Time: 3 Hours

Max. Marks : 80

**Part A**

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. State distributive laws of equivalence.
2. Define Existential quantifier.
3. Define Universal instantiation.
4. Use Venn diagram to show the relationship A is a subset of B
5. Define the sets  $A \cup B$  and  $A \cap B$ .
6. Let  $f_1, f_2$  be functions from  $R$  to  $R$  defined by  $f_1(x) = x^2$  and  $f_2(x) = x - x^2$ . What is  $(f_1 f_2)(x)$  ?
7. Let  $R$  be the relation  $R = \{(a, b) / a \text{ divides } b\}$  on the set of integers. Find  $R^{-1}$ .
8. Draw the diagram that represent the relation  $\{(1, 1), (1, 2), (1, 3), (2, 2), (2, 3), (3, 3)\}$  on  $\{1, 2, 3\}$
9. Check whether the relation  $R = \{(a, b) : a \text{ and } b \text{ are of same age}\}$  an equivalence relation. Explain.
10. Frame a quartic equation with rational coefficients one of whose roots is  $\sqrt{5} + \sqrt{2}$ .





11. If  $\alpha, \beta, \gamma, \delta$  are the roots of the equation  $x^4 + 4x^3 - 5x^2 - 8x + 6 = 0$ , find the values of  $\alpha + \beta + \gamma + \delta$  and  $\alpha\beta\gamma\delta$ .
12. Define biquadratic equation? Write the general form of the quartic equation which can be solved using Ferrari's method?

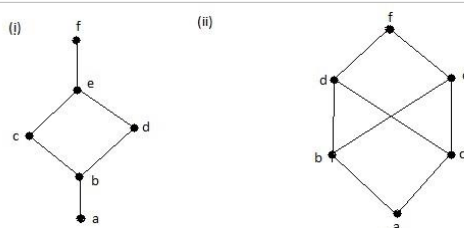
(10×2=20)

### Part B

Answer any **six** questions.

Each question carries **5** marks.

13. Check whether  $p \vee \neg(p \wedge q)$  a tautology.
14. Show that  $\exists x[P(x) \wedge Q(x)]$  and  $\exists xP(x) \wedge \exists xQ(x)$  are not logically equivalent.
15. Define Modus tollens and Modus ponens. Write the truth table of the above rules of inference for propositional logic.
16. Prove that  $\overline{A \cap B} = \overline{A} \cup \overline{B}$
17. Define and plot the greatest integer function
18. Let  $S = \{1, 2, 3, 4, 5, 6\}$ . Show that the collection of sets  $A_1 = \{1, 2, 3\}$ ,  $A_2 = \{4, 5\}$  and  $A_3 = \{6\}$  forms a partition of S. List the ordered pairs in the equivalence relation R produced by this partition.
19. Determine whether the posets with these Hasse Diagrams are lattices.



20. Solve by Cardan's method  $x^3 - 9x - 12 = 0$ .
21. Solve  $x^6 - 9x^5 + 21x^4 - 21x^2 + 9x - 1 = 0$ ?

(6×5=30)

### Part C

Answer any **two** questions.

Each question carries **15** marks.





22. (a) Prove that  $\sqrt{2}$  is irrational by the method of contradiction.  
(b) Show that the following statements about the integer  $n$  are equivalent.  
(i)  $n$  is even  
(ii)  $n - 1$  is odd.  
(iii)  $n^2$  is even.
23. a) Let  $f : A \rightarrow B$  and  $S, T$  be subsets of  $A$ . Show that  
 $f(S \cup T) = f(S) \cup f(T)$  and  $f(S \cap T) \subseteq f(S) \cap f(T)$   
b) Consider the equivalence relation  $R = \{(x, y) / x - y \text{ is an integer}\}$ . What are the equivalence classes of 1 and  $\frac{1}{2}$  for this relation
24. Let  $R$  and  $S$  be relations on a set  $A$  represented by the matrices  
 $M_R = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$  and  $M_S = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ . Find the matrices that represents  
(a)  $R \cup S$  (b)  $R \cap S$  (c)  $S \circ R$  (d)  $R \circ R$  (e)  $R \oplus S$
25. a) If  $\alpha, \beta, \gamma$  are the roots of  $x^3 + px + q = 0$  form the equation whose roots are  
 $\alpha^2 + \beta\gamma, \beta^2 + \gamma\alpha, \gamma^2 + \alpha\beta$ .  
b) Find the equation whose roots are the roots of  $2x^5 - 9x^3 + 4x + 3 = 0$  each  
increased by 2.

(2×15=30)

