19101097

QP CODE: 19101097

Reg No : ....

Name : ....

B.Sc.DEGREE (CBCS) EXAMINATION, DECEMBER 2018

First Semester

Core Course - MM1CRT01 - FOUNDATION OF MATHEMATICS

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

2017 Admission (Reappearance)

C793EB13

Maximum Marks: 80 **Time: 3 Hours**

Part A

Answer any **ten** questions.

Each question carries **2** marks.

1. Define inverse of a conditional statement $p \to q$.
2. State and prove double negation laws of logical equivalence.
3. Define Existential instantiation.
4. Use Venn diagram to show the relationship A is a subset of B
5. Write De- Morgan's laws in set theory
6. Find the domain, codomain and range of $f(x) = x^2$ where $f : Z \to Z$
7. Explain the terms reflexive relation and irreflexive relation withexamples.
8. List the ordered pairs in the relaiton on $\{1, 2, 3, 4\}$corresponding to the matrix $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$
9. Explain the term Partition of a set with example.
10. Form a rational cubic equation whose roots are $2, 3 + i$.
11. If α, β, γ be the roots of the equation $ax^3 + bx^2 + cx + d = 0$ then find $\alpha\beta + \beta\gamma + \alpha\gamma$ and $\alpha + \beta + \gamma$.
12. Find any two rational roots of the equation $x^4 - x^3 - 19x^2 + 49x - 30 = 0$?

(10×2=20)

Part B

Answer any **six** questions.

Each question carries **5** marks.

13. Define Existential quantifier and universal quantifier by giving an example.

14. Show that $\exists x[P(x) \wedge Q(x)]$ and $\exists x P(x) \wedge \exists x Q(x)$ are not logically equivalent.

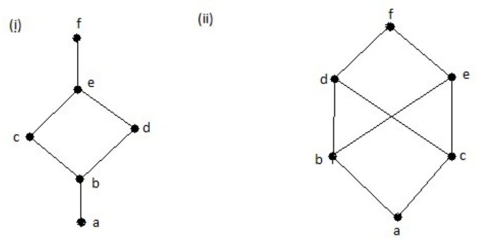
15. Define Modus tollens and Modus ponens. Write the truth table of the above rules of inference for propositional logic.

16. Let $f(x) = ax + b$ and $g(x) = cx + d$ where a, b, c, d are constants. Determine for which constants a, b, c, d it is true that $f \circ g = g \circ f$

17. Prove or disprove $\lceil x + y \rceil = \lceil x \rceil + \lceil y \rceil$ for all real numbers x and y

18. Suppose that R is the relation on the set of strings of English letters such that ${}_a R_b$ if and only if $l(a) = l(b)$ where $l(x)$ is the length of string x.Is R an equivalence relation ?

19. Determine whether the posets with these Hasse Diagrams are lattices.



20. Solve by Cardan's method $x^3 - 12x - 65 = 0$.

21. Solve the equation $x^{10} - 3x^8 + 5x^6 - 5x^4 + 3x^2 - 1 = 0$?

(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 $f : A \to B$ 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 $R = \{(x, y)/x - y$ is an integer$\}$. What are the equivalence classes of 1 and $\frac{1}{2}$ for this relation

24. Draw the diagraph of the relation represented by the following matrices : (i) $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (ii) $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$

And hence determine whether these relations are reflexive, irreflexive,symmetric,asymmetric,antisymmetric,and/or transitive.

25. a) If α, β, γ 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)