22102226

QP CODE: 22102226

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, JULY 2022

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

9B667A0C

Time: 3 Hours

Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. State and prove commutative laws for logical equivalence.
2. Give an example for universal quantifier.
3. Define Universal instantiation.
4. Define a set and its elements
5. Let f_1, f_2be functions from R to R defined by $f_1(x) = x^2$ and $f_2(x) = x - x^2$. What is $(f_1 f_2)(x)$?
6. Differentiate between f^{-1} and $\frac{1}{f}$
7. Let R be the relation $R = \{(a, b) \ / \ a < b\}$ on the set of integers.Find $\overline{R}$.
8. Draw the diagraph that represent the relation $\{(1,1),(1,4),(2,2),(3,3),(4,1)\}$ *on the set* $\{1,2,3,4\}$.
9. Check whether the collection $\{\{1,2\}, \{2,3,4\}, \{4,5,6\}\}$ form a partition of set $\{1,2,3,4,5,6\}$.
10. Transform the equation $x^3 - \frac{5}{2}x^2 - \frac{7}{18}x + \frac{1}{108} = 0$ into one with integral coefficients and leading coefficient is unity.

11. State Descartes Rule of Signs.

12. Check the validity of the following statement with proper reasoning.
"x=-1 is always a root of the odd degree reciprocal equation of second kind"?

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Find the truth table of $(p \vee (q \wedge r)) \rightarrow (q \wedge r)$.

14. State and prove De-Morgan's laws for quantifiers.

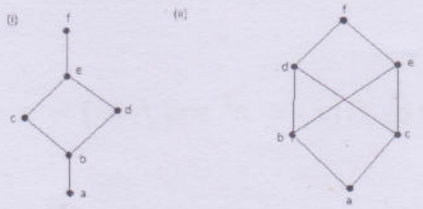
15. Prove that if n is a positive integer, then n is odd if and only if $5n + 6$ is odd.

16. Prove that $\overline{A \cap B} = \overline{A} \cup \overline{B}$

17. Let $A_i = \{i, i+1, i+2, \ldots,\}$. Find $\cup_{i=1}^{n} A_i$ and $\cap_{i=1}^{n} A_i$

18. Suppose that the relations R and S on a set A are represented by the matrices $M_R = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$ and $M_S = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$. What are the matrices representing $R \cup S$ and $R \cap S$.

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



20. Prove that every polynomial of degree n has n and only n zeroes.

21. Solve $x^4 + 6x^3 + 4x^2 - 32 = 0$ using Ferrari's method?

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. (a) Check the validity of the following arguments:

H_1 : If the computer was down saturday afternoon, then Mary went to a matinee.

H_2 : Either Mary went to a matinee or took a nap saturday afternoon.

H_3 : Mary did not take a nap that afternoon

Conclusion: The computer was down saturday afternoon.

(b) Define (i) Modus ponens

(ii) Modus tollens

(iii) Addition

for propositional logic. Also write truth tables for the above propositional logics.

23. a) Define and plot the graphs of floor and ceiling functions

b) Show that congruence modulo 6 is an equivalence relation

24. (a) Define equivalence relation . Check whether the relation congruence modulo 5 is an equivalence relation .

(b) Explain the term equivalence class. Give description of each of the congruence classes modulo 6.

25. a) Solve the equation $81x^3 - 18x^2 - 36x + 8 = 0$whose roots are in harmonic progression.

b) Solve the equation $x^4 - 2x^3 + 4x^2 + 6x - 21 = 0$given that two of its roots are equal in magnitude and opposite in sign.

(2×15=30)