QP CODE: 19103096

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Reg No : ....

Name : ....

B.Sc.DEGREE (CBCS) EXAMINATION, NOVEMBER 2019

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 Onwards

97F743A0

Time: 3 Hours Maximum Marks :80

Part A

*Answer any **ten** questions.*

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

1. State distributive laws of equivalence.
2. Translate the following sentence into logical expression.
   'Hiking is not safe on the trail whenever grizzly bears are seen in the area and berries are ripe along the trail'.
3. Define Universal generalization.
4. Define the sets $A \cup B$ and $A \cap B$.
5. Let $A_i = \{i, i+1, i+2, \ldots, \}$. Find $\cap_{i=1}^{n} A_i$
6. Define strictly increasing and strictly decreasing functions.
7. Let R be the relation $R = \{(a, b) \ / \ a \ < \ b\}$ on the set of integers.Find R^{-1}.
8. What are te equivalence classes of 0 and 2 for congruence modulo 4.
9. Prove or disprove : The set of positive integers and the set of negative integers together form a partition of set of integers.
10. State Fundamental Theorem of algebra.
11. Form an equation whose roots are three times those of the equation $x^3 - x^2 + x + 1 = 0$.
12. Show that the equation $12x^7 - x^4 + 10x^3 - 28 = 0$ has atleast 4 imaginary roots?

(10×2=20)

Part B

*Answer any **six** questions.*

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

13. Show that $(p \to q) \leftrightarrow (\neg p \vee q)$ is a tautology.

14. Use rules of inference to show that the hypotheses 'Ravi works hard', 'If Ravi works hard, then he is a dull boy' and 'If Ravi is a dull boy, he will not get the job' imply the conclusion 'Ravi will not get the job'.

15. Show that if $'n'$ is an integer and $n^3 + 5$ is odd, then $'n'$is even by using the method of contraposition.

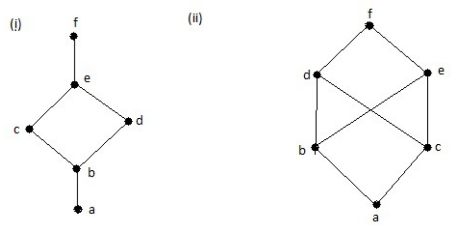
16. Let $A = \{a, b, c\}$, $B = \{x, y\}$, $C = \{0, 1\}$. Find $C \times B \times A$

17. Define and plot the ceiling function

18. Draw the diagraph representing the following relations:

(a) $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$

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



20. Solve the equation $x^3 + 4x^2 - 12x - 27 = 0$, given that its roots are in GP.

21. Show that the equation $x^4 - 3x^3 + 4x^2 - 2x + 1 = 0$ can be transformed into a reciprocal equation by diminishing the roots by unity,then solve the equation?

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. (a) Let $P(x)$ denotes the statement $x < 4$. What are the truth values of the following propositions?

$(i)P(0)$ $(ii)P(4)$ $(iii)P(3)$

(b) Let $P(x)$ denotes the statement $x = x^4$.. What are the truth values of the following propositions if the domain consists of integers.

$(i)\exists x\, P(x)$ $(ii)\forall x\, P(x)$ $(iii)\forall x\, \neg P(x)$

(c) Find a counter example, if possible, to the following universally quantified statements, where the domain consists of all integers.

$(i)\forall x(x^2 \geq x)$ $(ii)\forall x(x > 0 \vee x < 0)$ $(iii)\forall x(x = 1)$

(d) Define by an example.

(i) Universal quantifier.

(ii) Existential quantifier.

23. a) Prove $\lfloor 2x \rfloor = \lfloor x \rfloor + \lfloor x + \frac{1}{2} \rfloor$ where x is a real number

b) Consider the relations defined on the set of all positive integers by $R_1 = \{(a,b)/a$ divides $b\}$ and $R_2 = \{(a,b)/a$ is a multiple of $b\}$. Then find $R_1 \cup R_2, R_1 \cap R_2, R_1 - R_2$ and $R_2 - R_1$

24. Let R be the relation represented by the matrix $M_R = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$.Find the matrices representing

(a) R^{-1} (b) $\bar{R}$ (c) R^2 (d) R^3 $(e) R^4$

25. a) Solve $x^4 + 3x^3 + x^2 - 2 = 0$?

b) Determine the nature of the roots of the equation $x^4 + 3x^2 + 2x - 7 = 0$?

(2×15=30)