

24U113

(Pages: 2)

Name :

Reg. No :

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2024

(FYUGP)

CC24U MAT1 MN104 - MATHEMATICAL LOGIC, SET THEORY AND COMBINATORICS

(B.Sc. Mathematics - Minor Course)

(2024 Admission - Regular)

Time: 2.0 Hours

Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer **all** questions. Each question carries 3 marks.

1. Which of the following are propositions? [Level:2] [CO1]
(a) The sun is a star
(b) $x+3=5$
(c) Come in.
2. Define universal quantifier . Give a sentence using universal quantifier. [Level:1] [CO1]
3. Explain Set-Builder Notation. Give example. [Level:2] [CO2]
4. Is the collection $\{\{a, \dots, n\}, \{y, \dots, z\}, \{0, 3\}, \{1, 2, 4, \dots, 9\}\}$ is a partition of $\{a, \dots, z, 0, \dots, 9\}$. [Level:2] [CO2]
5. Define div function $g(x, y)$. [Level:1] [CO3]
6. Define domain and codomain of a function $f : x \rightarrow y$. [Level:1] [CO3]
7. Define the logarithm function. [Level:1] [CO3]
8. Find the number of r-combinations of the set $\{a, b, c\}$, when $r=0, 1, 2$ or 3 [Level:2] [CO5]
9. Define Inclusion -Exclusion and addition principles of discrete probability. [Level:2] [CO5]
10. Find the number of two letter words that begin with a vowel in English alphabet . [Level:2] [CO5]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer **all** questions. Each question carries 6 marks.

11. Simplify the boolean expression [Level:2] [CO1]
(a) $p \vee (\sim p \wedge q)$.
(b) $p \vee (p \vee q)$

12. Test the validity of the following argument. [Level:3] [CO1]
 If I study, then I will not fail mathematics.
 If I do not play basketball, then I will study.
 But I failed mathematics.
-
- Therefore I must have played basketball.
13. Define the infinite rays $(-\infty, a]$, $[a, \infty)$, $(-\infty, a)$ and (a, ∞) in set builder form. [Level:2] [CO2]
14. Draw the Venn Diagrams for the symmetric difference denoted by $A\Delta B$. [Level:2] [CO2]
15. If $f(x) = x^3 - x^2 + x + 1$ and $g(x) = x^4 + x^2$ Find $(f + g)(x)$ and $(fg)(x)$. [Level:2] [CO3]
16. If $A = \begin{bmatrix} -1 & 2 \\ 3 & 0 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 3 \\ 5 & -1 \end{bmatrix}$, and $C = \begin{bmatrix} 2 & 1 \\ 1 & 6 \end{bmatrix}$. Show that $(AB)C = A(BC)$ [Level:2] [CO4]
17. (a) Find the number of words that can be formed by scrambling the letters of the word EDUCATION. [Level:3] [CO5]
 (b) Prove that the cyclic permutations of n distinct items is $(n - 1)!$.
18. Five marbles are drawn at random from a bag of seven green marbles and four red marbles. Find the probability that four are green and three are red. [Level:3] [CO5]

(Ceiling: 36 Marks)

Part C (Essay questions)

Answer any **one** question. The question carries 10 marks.

19. Verify that [Level:2] [CO1]
 (a) $p \vee \sim (p \wedge q)$ is whether or not a tautology.
 (b) $(p \wedge q) \wedge \sim (p \vee q)$ is whether or not a contradiction.
 (c) $(p \rightarrow q) \wedge (\sim q) \rightarrow \sim p$ is whether or not a tautology
20. Find the number of positive integer less than 500 and divisible by two, three or five. [Level:2] [CO2]

(1 × 10 = 10 Marks)
