

CLASS: BTECH
BRANCH: CS/IT

SEMESTER: III
SESSION: MO/2022

SUBJECT: MA205 DISCRETE MATHEMATICS

TIME: 2 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q1 (a) Show that $(\sim p \wedge (p \vee q)) \Rightarrow q$ is a tautology [2] CO1 BL
BT4
- Q1 (b) Find the least n for which the statement is true and then using mathematical induction prove that $(1 + n^2) < 2^n$ [3] CO1 BT1
- Q2 (a) Find whether $(p \wedge q) \rightarrow q$ and $\overline{(p \wedge q)} \vee q$ is logically equivalent or not. [2] CO1 BT1
- Q2 (b) Prove or disprove. $\forall x \in \mathbb{R}, x^3 > x^2$. [3] CO1 BT5
- Q3 (a) Solve $a_{r+1} - \cos \alpha a_r + a_{r-1} = 0$ [2] CO1 BT3
- Q3 (b) Find the solution of the following recurrence relation $a_{r+1} - a_r = r^2$ [3] CO1 BT1
- Q4 (a) Solve the recurrence relation $a_r - 2a_{r-1} + a_{r-2} = 2^r$; $r \geq 2$ by the method of generating function satisfying the boundary conditions $a_0 = 2, a_1 = 1$ [2] CO1 BT3
- Q4 (b) Solve the recurrence relation $a_{r+3} + 16a_{r-1} = 0$ [3] CO1 BT3
- Q5 (a) Let $A = \{1, 2, 3, 4, 5\}$ and R be the relation defined by $a R b$ if and only if $a < b$. Compute R^2 and R^3 [2] CO2 BT3
- Q5 (b) Determine whether the relation S on the set A is symmetric, antisymmetric and transitive. Set $A = \mathbb{R}^2 \setminus (0,0)$. The relation S is defined as $(x_1, y_1) S (x_2, y_2)$ if only if $x_1 \cdot y_2 = x_2 \cdot y_1$ [3] CO2 BT4