

S-1135

M. A./M. Sc. (First Semester)

EXAMINATION, 2017-18

MATHEMATICS

Paper First

(Discrete Structures)

(MATH-001)

Time : Two Hours]

[Maximum Marks : 60

Note : Attempt any four questions. All questions carry equal marks.

1. Define recurrence relations and its kinds. Solve the following recurrence relations using generating function method :

(i) $a_{n+2} - 3a_{n+1} + 2a_n = 0$

with initial conditions $a_0 = 2, a_1 = 3.$

(ii) $a_{n+2} - 5a_{n+1} + 6a_n = 0$

with initial conditions $a_0 = 1, a_1 = 2.$

2. Find the solution of the following recurrence relations :

(i) $a_{n+2} + 5a_{n+1} + 6a_n = 3n^2 - 3n - 1$

(ii) $a_{n+2} - 3a_{n+1} + 2a_n = b^n$

where b is a constant.

3. Write short notes on any five of the following with examples :

(i) Complete and Regular Graph

(ii) Euler's Graph

(iii) Directed and Indirected Graph

(iv) Planar Graph

(v) Graph Isomorphism

(vi) Null, wheel and cycle graph

(vii) Operations of graphs

(viii) Walk, Path and Circuit

(ix) Order, Size, Rank and Nullity of Graph

4. (a) Discuss Graph. State and prove first fundamental theorem of Graph theory. Give an example also.

(b) Show that the following sequence is Graphical. Also find the graph corresponding to the sequence 6, 5, 5, 4, 3, 3, 3, 3, 2.

5. Define Boolean algebra and its properties :

(a) If B be a Boolean algebra, then show that :

(i) $a + a = a$ and $a \cdot a = a \forall a \in B$

(ii) $a + 1 = 1$ and $a \cdot 0 = 0 \forall a \in B$

(b) Define Boolean function and D. N. form. Write down the function $f = (XY' + XZ)' + X'$ in D. N. form.

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[3]

6. Discuss the method for minimization of Boolean functions with the help of Karnaugh Map.

Using Karnaugh map find the minimal form for the following Boolean functions :

(i) $f(X, Y, Z) = XYZ + XYZ' + X'YZ' + X'YZ$

(ii) $f(X, Y, Z, W) = X'YZW + XY'ZW' + X'Y'ZW' + X'YZ'W + XY'ZW'$

7. Explain any *three* of the following with examples :

- (i) Lattice as a partially ordered set
- (ii) Direct product of Lattices
- (iii) Bounded Lattices
- (iv) Complemented Lattices
- (v) Application of Boolean algebra to Switching circuits.
- (vi) Modular lattices
- (vii) Distributive Lattices

8. (a) Define the dual of a lattice.

Prove that the dual of a lattice is a lattice.

(b) If (L, \leq) is a lattice, then for any $a, b, c \in L$, show that :

(i) $a \wedge b = b \wedge a$ and

$a \vee b = b \vee a \quad \forall a, b \in L$

(ii) $a \wedge (b \wedge c) = (a \wedge b) \wedge c$ and

$a \vee (b \vee c) = (a \vee b) \vee c \quad \forall a, b, c \in L$

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