Total Pages : 4

K-1049

M.A./M.Sc. (Previous) Main Examination, 2022

MATHEMATICS

(Advanced Discrete Mathematics)

[Paper : Second (Optional)]

Time Allowed : Three Hours

Maximum Marks : 100

Minimum Passing Marks : 36

Note : Attempt **any five** questions. Each question carries **equal** marks.

1. (a) Explain types of Grammar and Language.

   (b) Write short notes on Phrase Structure Grammars.

2. (a) Prove that the order relation $\subseteq$ is partial order relation in a boolean algebra.

(b) To prove that for any two elements a, b of a boolean algebra $(B, +, \cdot)$:

(i) $a + b = lub\{a, b\}$

(ii) $a \cdot b = \frac{g}{b}\{a, b\}$

3. Define with examples of the following :

(i) OR-gate

(ii) AND-gate

(iii) NOT-gate

(iv) NOR-gate

(v) NAND-gate

4. (a) Let G be a graph with n vertices. If G has k components, then the maximum number of edges that G can have are $\frac{(n-k)(n-k+1)}{2}$.

(b) Explain the Chinese Postman Problem.

5. (a) Construct a grammar which generates all even integers upto 998.

(b) Show that $L = \{0^i 1^i : i \geq 1\}$ is not regular.

6. (a) Write and prove fundamental theorem of homomorphism of Groups.

(b) State and prove Cayley's theorem.

7. (a) State and prove Lagrange's theorem.

(b) Prove that every finite semigroup has an idempotent element.

8. (a) Define with examples of the following :

(i) Moore machine

(ii) Mealy machine

(b) Write short notes on Travelling Salesman Problem.

9. (a) Find the Simplified Boolean Expression for the function whose Karnaugh map is :

1	1	1	1
1	0	0	1

(b) Change the following Boolean function to disjunctive normal form :

$$f(x,y,z)=\left[x+(x'+y)'\right]\cdot\left[x+(y'\cdot z')'\right]$$

10. (a) Change the following Boolean function to conjunctive normal form :

$$f(x,y,z,t)=(x'\cdot y+x\cdot y\cdot z'+x\cdot y'\cdot z+x'\cdot y'\cdot z'\cdot t+t')'$$

(b) Write and prove De-Morgan's Laws for a boolean algebra.

----x----