13004

M.C.A DEGREE EXAMINATION, DECEMBER 2019.

FIRST SEMESTER

Paper IV – MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS

Time : Three hours Maximum : 75 marks

(No additional sheet will be supplied)

PART A — (5 × 3 = 15 marks)

Answer any FIVE questions.

Each question carries 3 marks.

1. Define Elgen values and Eigen vectors.

2. State Cayley-Hamilton theorem.

3. If A,B and C are sets, prove that $A \cup (B \cap C) = (A \cup B) \cap (B \cup C)$.

4. State the Principle of Inclusion-Exclusion

5. Define contradiction and contingency.

6. Construct truth table for $P \to Q \wedge Q \to P$.

7. State pumping lemma for regular languages.

8. State Pumping Lemma for regular sets.

PART B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

9. Find the eigen values and eigen vectors of the matrix

(a) $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$ (b) $A = \begin{pmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{pmatrix}$

Or

10. (a) Find the rank of the matrix

$$\begin{pmatrix} 2 & -1 & 2 & 1 \\ 3 & 6 & 0 & 4 \\ 4 & 4 & -3 & 0 \\ 5 & -1 & 0 & 6 \end{pmatrix}$$

(b) Find the rank of the matrix

$$\begin{pmatrix} 1 & -1 & 2 & 1 \\ 3 & 1 & 1 & 4 \\ 1 & 3 & -3 & 2 \\ 5 & -1 & 5 & 6 \end{pmatrix}$$

11. (a) State and prove Demorgan's laws.

(b) For any three sets A,B and C, prove that $AX(B \cup C) = (AXB) \cup (AXC)$.

Or

12. (a) Find the number of positive integers not greater than 1000 that are not divisible by 2,3,5 or 7.

(b) write a short note venn diagrams and set operations.

13. (a) Obtain PCNF and PDNF of the formula given by $(\neg p \to r) \wedge (q \to p)$.

(b) Show that $[(p \vee q) \wedge (\sim p \vee r)] \to (q \vee r)$ is a tautology.

Or

14. (a) Write about propositional calculus and predicate calculus.

(b) Write a short note on connectives, normal forms.

15. (a) Give an NFA recognizing the language.

(b) Construct a deterministic finite state automata equivalent to the following NFA.

Or

16. (a) Construct a DFA equivalent to the NFA represented by the state.

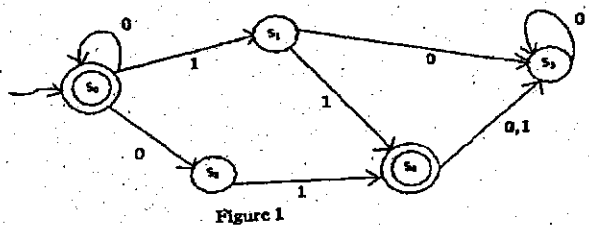

Figure 1

(b) Determine the language by the deterministic Finite-state Automation.