



Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956)
Re-accredited with 'A+' Grade by NAAC. Recognised by UGC Under Section 12B
Coimbatore - 641 043, Tamil Nadu, India

Bachelor of Vocation Degree Examination – March 2021
I Semester

Class : I B. Voc
Major : Artificial Intelligence and Machine Learning

Time : 3 Hours
Max. Marks: 100

20VAIC03 Applied Mathematics

Part A
Choose the correct answer

10 x 1=10

- If any two rows and columns of a determinant are interchanged, the determinant
a. vanishes b. is unaltered c. changes its sign d. becomes 1
- If A and B are two square matrices of same order, then $(AB)^{-1} = \underline{\hspace{2cm}}$.
a. $A^{-1}B^{-1}$ b. $B^{-1}A^{-1}$ c. $|A| |B|$ d. $\frac{adj(AB)}{|A|}$
- De Morgan's law is given by $(A \cap B)^c = \underline{\hspace{2cm}}$.
a. $A^c \cap B^c$ b. $A^c \cup B^c$ c. $A \cup B$ d. $A \cap B$
- R is a binary relation on a set A . If aRb , then bRa for any $a, b \in A$, then R is called _____.
a. reflexive b. symmetric c. transitive d. anti-symmetric
- Probability of the impossible event is equal to
a. 1 b. 1/2 c. 0 d. ∞
- The set of all possible outcomes of a random experiment is called _____.
a. sample space b. event space c. random space d. vector space
- Gauss-Seidel method converges to the solution when the system is _____.
a. consistent b. inconsistent
c. triangular d. diagonally dominant
- In Gauss-elimination method, the coefficient matrix is transformed to _____ matrix.
a. lower triangular b. upper triangular c. triangular d. diagonal
- A finite automaton in which, for each input symbol there is exactly one transition out of each state is called _____ automaton.
a. deterministic b. non-deterministic c. pushdown d. regular
- With usual notations, a grammar G is said to be _____ if the productions are of the $A \rightarrow a$ or $A \rightarrow aB$ or $A \rightarrow \lambda$.
a. regular b. context-sensitive c. context-free d. irregular

Part B**5 x 6 = 30****Answer ALL questions****Each answer should not exceed 400 words or two pages**

11.a. If $A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ -1 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$, prove that $AB \neq BA$.

(or)

11.b. Determine the inverse of the matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$.

12.a. If A , B and C are three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$, show that $B = C$.

(or)

12.b. Find $f \circ g$ and $g \circ f$ if $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ are defined by $f(x) = 5x - 2$ and $g(x) = x^2 + 1$.

13.a. State and prove addition law of probability.

(or)

13.b. If A and B are independent events, prove that \bar{A} and \bar{B} are also independent.

14.a. Explain the procedure of Gauss-Seidel method.

(or)

14.b. Solve the following system by Gauss elimination method:

$$\begin{aligned} x + y + z &= 9 \\ 2x - 3y + 4z &= 13 \\ 3x + 4y + 5z &= 40 \end{aligned}$$

15.a. Define a non-deterministic finite automaton and give an example for the same.

(or)

15.b. If $G = \{(S, A), (a, b), S, P\}$ where $P = \{S \rightarrow aAa, A \rightarrow aAa, A \rightarrow b\}$, show that $L(G) = \{a^n b a^n / n \geq 1\}$.

Part C**5 x 12 = 60****Answer ALL questions****Each answer should not exceed 800 words or four pages**

16.a. Verify Cayley-Hamilton theorem to for the matrix $\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$.

(or)

16.b. Find the characteristic equation of the matrix $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & 1 \\ 1 & -1 & 1 \end{bmatrix}$ and verify that the matrix satisfies its own characteristic equation.

17.a. Write a note on composition of relations and matrices of relations. Let R and S be two relations defined on the set $\{1, 3, 5\}$ given by xRy iff $y = x + 2$ and xSy iff $x \leq y$. Determine RS and SR .

(or)

17.b. Let R be a relation on the set of all ordered pairs of positive integers defined by $(x, y)R(u, v)$ if and only if $xv = yu$. Show that R is an equivalence relation.

18.a. State and prove Baye's theorem.

(or)

18.b. Urn I contains 2 white, 3 black and 4 red balls; urn II contains 3 white, 2 black and 2 red balls and urn III contains 4 white, 1 black and 3 red balls. An urn is chosen at random and two balls are drawn. They happen to be white and red. What is the probability that they come from urns I, II or III?

19.a. Solve the following system using Gauss-elimination method.

$$30x - 2y + 3z = 75$$

$$x + 17y - 2z = 48$$

$$2x + 2y + 18z = 30$$

(or)

19.b. Solve the following system of equations using Gauss-Seidel method:

$$8x - y + z = 18$$

$$2x + 5y - 2z = 3$$

$$x + y - 3z = -6$$

using Gauss-Seidel method.

20.a. Construct the grammar G for the language given by $\{a^i b^i c^i / i \geq 1\}$. Hence derive the string $a^3 b^3 c^3$ and draw its derivation tree.

(or)

20.b. Explain briefly about different types of phrase structure grammar together with suitable examples.
