

1C8110

Roll No. _____

Total No. of Pages: **4****1C8110****MCA I-Sem. (Main / Back) Exam., -2025****MCA-101 Mathematical Foundations in Computer Science****Time: 3 Hours****Maximum Marks: 70****Min Passing Marks: 28***Instructions to Candidates:*

Attempt all Ten questions from Part A. All five questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

1. NIL2. NIL**PART – A****[10×2=20]****(Word limit 25)**

- ✗Q.1 If a matrix has dimensions $m \times n$, what is the maximum possible rank?
- ✗Q.2 Give an example of a relation that is symmetric but not transitive.
- ✓Q.3 A bag contains 5 red balls and 3 green balls. If two balls are drawn randomly without replacement, find the probability that both are red.

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- ✓ Q.4 Define variance and standard deviation. How are they related?
- ✓ Q.5 Define a proposition. Provide an example.
- ✓ Q.6 What do you mean by functionally complete set of connectives?
- ✗ Q.7 How is relative error calculated, and why is it more informative in some cases than absolute error?
- ✓ Q.8 Evaluate $8.32E7 \div 4.16E3$.
- ✓ Q.9 What are isomorphic graphs? Mention a condition for two graphs to be isomorphic.
- ✓ Q.10 What is the minimum number of edges in a spanning tree for a graph with n vertices?

PART – B

[5×4=20]

(Word limit 100)

- ✓ Q.1 Let $f(x) = 2x + 1$ and $g(x) = x^2 + 2$. Find the values of $(g \circ f)(4)$ and $(f \circ g)(4)$. Also, show that they are not equal.
- Q.2 A factory machines A and B are producing springs of the same type. Of this production, machines A and B produce 5% and 10% defective springs respectively. Machines A and B produce 40% and 60% of the total production output of the factory. One spring is selected at random and it is found to be defective. What is the probability that this defective spring was produced by machine C?

- ✓ Q.3 A boy promises a girl "I will take you park on Monday if it is not raining".
When the boy would be deemed to have broken his promise. Explain with the help of truth table.
- ✓ Q.4 Convert $(0.4140625)_{10}$ to the corresponding binary fraction.
- ✓ Q.5 Determine whether the graph given below by its adjacency matrix is connected or not.

$$\begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

PART – C

[3×10=30]

(Attempt any three questions)

- ✓ Q.1 Solve the system of equations – <https://www.rtuonline.com>
- $$\begin{aligned} x + y + z &= 6 \\ 2x + 3y + 4z &= 20 \\ x + y &= z \end{aligned}$$
- Q.2 The arithmetic mean and variance of a set of 10 figures are known to be 17 and 13 respectively. Of the 10 figures, one figure (i.e., 26) was subsequently found inaccurate, and was weeded out. What is the resulting (a) Arithmetic mean and (b) Standard deviation?
- ✓ Q.3 Prove that, if the joint operation is distributive over the meet operation in a lattice, then the meet operation is also distributive over the joint operation. i.e.

$$a \vee (b \wedge c) = (a \vee b) \wedge (a \vee c).$$

✂Q.4 Explain the different types of errors encountered in numerical computation. Find out the absolute and relative errors, where the actual and measured values are 315.60 kg and 310.48 kg.

✓Q.5 Write short notes on the following -

- (i) Eulerian and Hamiltonian graph
- (ii) Multi graph and Planer graph

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