1C8110

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M.C.A. I - Sem. (Main / Back) Exam., - 2023
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 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.   NIL _____   2.   NIL _____

PART – A
[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Suppose a matrix A has rank 5 and we find a matrix B after applying elementary column operations on A. What will be the rank of B?

Q.2 A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has at least three girls?

Q.3 When A and B are two mutually exclusive events such that $P(A) = \frac{1}{4}$ and $P(B) = \frac{1}{3}$, find $P(A \cup B)$ and $P(A \cap B)$.

Q.4 Find the standard deviation for the following data – 4, 7, 10, 12, 19 தை

Q.5 Define Tautology with example.

Q.6 What do you mean by functionally complete set of connectives?

Q.7 What do you mean by underflow and overflow conditions in floating point's addition and subtraction?

Q.8 Evaluate –

$0.5367E4 + 0.6736E6$

Q.9 What are paths in a circuit?

Q.10 Let 'G' be a connected planar graph with 20 vertices and the degree of each vertex is 3. Find the number of regions in the graph.

PART – B   [5×4=20]

(Analytical/Problem solving questions)

Attempt all five questions

Q.1 Determine rank of the following matrix –

$$A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}.$$

Q.2 In hardware factory machines A, B and C manufactures respectively 25%, 30% and 45% of the total products. Of their output 5, 4, 2 percentages are defective. A sample is drawn at random from the product and is found to be defective. What is the chance that it was manufactured by the machine B or C?

Q.3 Construct the truth table for the following statements and check whether it is a tautology or contradiction – https://www.rtuonline.com

(i) $(p \wedge q) \vee (q \wedge r) \vee (r \wedge p) \Leftrightarrow (p \vee q) \wedge (q \vee r) \wedge (r \vee p)$

(ii) $(p \wedge q) \rightarrow (p \vee q)$

Q.4 Convert $(0.4140625)_{10}$ to the corresponding binary fraction.

Q.5 Explain adjacency and incidence matrices for graphs with examples.

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Let A = {4,6,8,10} and R = { (4,4), (4,10), (6,6), (6,8), (8,10) }, find the transitive closures of R.

Q.2 Find mean, variance and standard deviation for the following data –

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequencies	2	5	8	6	3	2

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 What is meant by absolute and relative errors? Find out the absolute and relative errors, where the actual and measured values are 252.14 mm and 249.02 mm.

Q.5 Write a short notes on any two –

(i) Eulerian and Hamiltonian graph

(ii) Multi graph and Planer graph

(iii) Spanning Trees