Seat No.	

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Kamala College, Kolhapur

(Autonomous)

B.C.A. (Part-I) (Semester-II) (CBCS)

Examination November, 2023.

Mathematical Foundations for Computer Applications

Subject Code: AEC-312

Day and Date: Monday, 06/11/2023 **Total Marks: 80**

Time: 12.00 p.m. to 03.00 p.m.

Instructions:

1. **Que 1 and Que 8 are compulsory.**
2. **Attempt any three questions from Que. 2 to Que. 7.**
3. **Figures to the right indicate full marks.**

Que.1) Select the correct alternative and rewrite the statement. [12]

1) If n (A) =3, n (B) = 4, n (A $\cap$ B) = 2, then n (A $\cup$ B) is _____

a) 5 b) 7 c) 6 d) 4

2) Which of the following sentences is not a statement ?

a) 8 has 4 divisors b) read the book

c) 8 + 9 = 17 d) square of an odd number is even

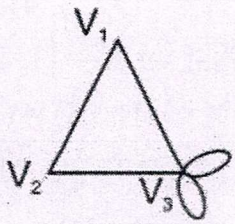
3) The Inverse of "If P then q' is _____

a) "If q then p" b) If ~ p then ~ q

c) If ~ q then ~ p d) ~ q v p

4) The degree of vertex V3 in the adjoining multigraph is _____

a) 2 b) 3 c) 6 d) 5



5) If U = { 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}
A = { 3, 5, 7, 9, 11} and B { 7, 8, 9, 10, 11}
then (A - B)' = _____

a) {2, 3, 5, 7, 9, 11, 12 } b) {2, 4, 6, 8, 10, 12 }
c) {2, 4, 6, 7, 8, 9, 10, 11} d) none of these

6) The dual of [(~ p v q) ∧ ~ q] v t

a) (p ∧ ~q) v q] ∧ t b) (p ∧ ~q) v q] ∧ c
c) (~p ∧ q) v ~ q] ∧ c d) (~p ∧ q) v ~ q] ∧ t

7) If the square matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & -1 \end{bmatrix}$ then A^2 is_____?

a) $\begin{bmatrix} 4 & 9 \\ 1 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 7 & 3 \\ 1 & 4 \end{bmatrix}$ c) $\begin{bmatrix} 3 & 9 \\ 1 & 4 \end{bmatrix}$ d) $\begin{bmatrix} 9 & 4 \\ 1 & 1 \end{bmatrix}$

8) Number of edges n 4-regular graph on 6 vertices is _____

a) 4 b) 6 c) 12 d) 24

9) A function f : R → R is defined by, f(x) = 3x - 4, for $-1 \leq x \leq 3$ then the Range of f is,

a) (7, 5) b) [7, -5] c) [-7, 5] d) (-7, -5)

10) Which of the following statements is true ?

a) 2 + 3 = 10 and 5 + 2 = 7 b) 7 + 2 = 9 and 3 + 8 = 15
c) 5 - 2 = 1 or 3 + 2 = 8 d) If 1+ 4 = 8 then 2 + 4 = 6

11) If the order of matrix A = [aij] is 3 x 2 and order of AB is 3 x 4, then the order of B is,

a) 3 x 4 b) 2 x 3 c) 2 x 4 d) 3 x 2

12) In a multigraph, a trial from v to w is a path from v to w that does not contain _____

a) repeated vertex b) repeated edges
c) loop d) none of these

Que-2) a) If A = {1, 2, 3, 4}, B = {3, 4, 5, 6}, C={4, 5, 6, 7, 8} and universal set X = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} then verify the following

i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

ii) $(A \cup B)' = A' \cap B'$

iii) $A = (A \cap B) \cup (A \cap B')$

b) Define finite and Infinite sets.

Also solve the following .

In a hostel, 25 students take tea, 20 students take coffee, 15 students take milk, 10 students take both tea and coffee, 8 students take both milk and coffee. None of them take tea and milk both and everyone takes at least one beverage.

Find the number of students in the hostel. [8+8]

Que.3) a) Define the valid argument and check the validity of argument.

If Suresh gets first class, he will get a job.

Suresh gets first class.

Therefore, Suresh gets a job.

b) Write the following statements in symbolic form and write their truth value.

i) 4 is odd or 1 is prime

ii) 64 is a perfect square and 46 is a prime number

iii) If 3 x 5 = 8 then 3 + 5 = 15

iv) Milk is white if and only if sky is blue. [8+8]

Que.4) a) Define a scalar matrix.

If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, show that $A^2 - 4A$ is a scalar matrix.

b) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 4 \\ 2 & -1 \end{bmatrix}$ then

Show that AB ≠ BA, but |AB| = |A| . |B| [8+8]

Que. 5) a) Define a Graph. Explain operations on graph (i.e. union, intersection and complement of a graph)

b) Define simple graph, multigraph, digraph and weighted graph with example. [8+8]

Que.6) a) Define the length of bit string.

And solve if A = {a, b, c}, B = {a, x, y}, C = {x, y}, then find

i) B X C ii) A x (B ∩ C) iii) A x (B ∪ C)

b) Define Tautology; contradiction statement patterns.

Also prove the following logical equivalence.

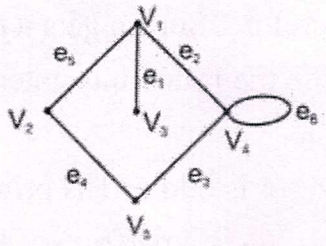
$\sim (p \vee q) \equiv \sim p \wedge \sim q$ [8+8]

Que.7) a) If $A = \begin{bmatrix} i & 2i \\ -3 & 2 \end{bmatrix}$ *and* $B = \begin{bmatrix} 2i & i \\ 2 & -3 \end{bmatrix}$, *where* $i = \sqrt{-1}$

Find A + B and A - B , show that A + B is singular. Is A - B singular ? Justify your answer.

b) Define complete graph and regular graph.

And also find adjacency and incidence matrix for the graph.



[8+8]

Q.8) Write notes on any Four of the following. [20]

1) Operation on sets.
2) Laws of Logic
3) Scalar matrix, symmetric matrix and non-singular matrix
4) Walk, path and cycle
5) Equal sets, Disjoint sets, Complement of a set
6) Converse, Inverse, Contrapositive

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