

Discrete Structures (MA5.101)

Quiz - 1 (Monsoon 2021)

International Institute of Information Technology, Hyderabad

Time: 60 Minutes

Total Marks: 30

Instructions: This is online examination.

Write at the top of your answer book the following:

Discrete Structures (MA5.101)

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Date: 17-December-2021

Name:

Roll Number:

Submit your scanned hand-written answer script in the moodle
with the file name: RollNo_Quiz1_SecNo_17Dec2021.pdf

December 17, 2021

1. Choose the correct option for the following questions:

- (a) Let $S(1), S(2), S(3), \dots, S(100)$ be a collection of 100 sets, where the cardinality of a set $S(i)$ is defined by $S(i) = i + 1$ and $S(i - 1)$ is subset of $S(i)$, where $i = 2, 3, \dots, 100$. Then, the cardinality of union of the all the sets $|S(1) \cup S(2) \cup \dots \cup S(100)|$ is _____.
- (A) 99
(B) 100
(C) 101
(D) 102
- (b) Let A and B be two disjoint sets, and the bit strings of them are 1111100000 and 1010101010, respectively. Therefore, $A \cup B$ is _____.
- (A) 1010100000
(B) 1010101101
(C) 1111111100
(D) 1111101010
- (c) Consider three sets X, Y , and Z , such that the sets $Y \cap Z, X \cap Y$, and $Z \cap X$ consists of 8, 7, and 7 elements, respectively. Then, the minimum element in set $X \cup Y \cup Z$ is _____.
- (A) 8
(B) 14
(C) 22
(D) 15

- (d) If $n(X)$ denotes the cardinality of a set X and $n(C \times D) = n(D \times C) = 64$, then which of the followings holds true?
- (A) $n(C) = 2, n(D) = 32$
 (B) $n(C) = 4, n(D) = 16$
 (C) $n(C) = 8, n(D) = 8$
 (D) None of the above
- (e) Let A_n and B_n be two sets, where A_n and B_n represent all the factors of n and all multiples of n less than 1000, respectively. Which of the below statement(s) is/are true?
- i. $A_{108} \cap A_{84} = A_{12}$
 ii. $B_{12} \cap B_{18} = B_{36}$
 iii. $B_{12} \subset (B_6 \cap B_4)$
 iv. $B_{12} \cup B_{18} = B_{36}$
- (A) i, ii and iv only
 (B) i, ii and iii only
 (C) i and ii only
 (D) None of them
- (f) A class have 40 students, where 12 students are registered for both History and Geography and 22 registered for Geography. If the students of the class registered for at least one of the two subjects, then the number of students registered for only History and not Geography is _____.
- (A) 30
 (B) 10
 (C) 18
 (C) 28
- (g) Let X , Y , and Z be three sets, where X contains all prime numbers and Y contains all even prime numbers, whereas the set Z contains all odd prime numbers. Then, which of the following statement(s) is/are true?
- (A) $X \equiv Y \cup Z$
 (B) Y is a singleton set.
 (C) $X \equiv Z \cup \{2\}$
 (D) All of the mentioned
- (h) A necessary and sufficient condition for $S + T = S \cup T$, where $S + T = (S \cap T') \cup (S' \cap T)$ is _____.
- (A) $S \cup T = \emptyset$
 (B) $S \cap T = \emptyset$
 (C) $S \cap T \neq \emptyset$
 (D) None of these
- (i) Let A and B be two set, and defined as $A = \{x|x \text{ is even number and } x < 15\}$ and $B = \{y|y \in Z_{13} - \{0\}\}$. Then, the symmetric diffence $A \triangle B$ is _____.
- (A) $\{1, 3, 5, 7, 9, 11, 14\}$
 (B) $\{1, 3, 5, 7, 9, 11, 13\}$

(C) $\{1, 3, 5, 7, 8, 9, 10, 11\}$

(D) $(Z_{13} - \{0\}) \cup \{1, 3, 5, 7, 9, 13\}$

(j) Let X, Y , and Z be any sets such that $X \oplus Z = Y \oplus Z$, where $X \oplus Y = (X - Y) \cup (Y - X)$. Then, the relation set between X and Y is _____.

(A) $X \cup Y = Y$

(B) $X \cap Y \neq \emptyset$

(C) $X \cap Y = \emptyset$

(D) $X = Y$

[10 × 1 = 10]

2. Applying the principle of inclusion-exclusion, find the number of positive integers ≤ 3000 and divisible by 3, 5 or 7.

[8]

3. If $\mathcal{P}(A)$ is the power set of a set A , then for any two sets A and B , prove or disprove the following:

(a) $\mathcal{P}(A \cap B) = \mathcal{P}(A) \cap \mathcal{P}(B)$

(b) $\mathcal{P}(A \cup B) = \mathcal{P}(A) \cup \mathcal{P}(B)$

(c) $\mathcal{P}(A - B) = \mathcal{P}(A) - \mathcal{P}(B)$

[4 + 4 + 4 = 12]

***** End of Question Paper *****