

Course Title: Discrete Structure
Discipline/Program: BSCS(3A), BSS
Total Marks: 30
Time allowed: 2.5 Hours

Question No 1: (3+3)

- a) Write an explicit formula for the following sequence and find the 19th term in the sequence using explicit formula.

$$1 - \frac{1}{2}, \frac{1}{2} - \frac{1}{3}, \frac{1}{3} - \frac{1}{4}, \frac{1}{4} - \frac{1}{5}, \dots$$



- b) Find the sum of series of first three hundred natural numbers through formula

Question No 2: (4+4)

- a) Define the type of each relation.
- $R1 = \{(1, 1), (1, 2), (1, 3), (2, 3)\}$
 - $R2 = \{(1, 2), (1, 4), (2, 3), (3, 4)\}$
 - $R3 = \{(2, 1), (2, 4), (2, 3), (3,4)\}$
 - $R4 = \{(2, 1), (2, 4), (2, 3), (3,4)\}$
- b) After that only draw the directed graph for reflexive relation.

Question No 3: (3+5)

- a) Find all functions from $X = \{ a, b \}$ to $Y = \{ u, v \}$.
- b) Using truth table identify critical rows and verify either argument is valid or invalid :
- Socrates has a new toga or he didn't waste 30 drachmas.
 - Plato has a pound of feta cheese or a quart of olive oil.
 - Socrates wasted 30 drachmas and Plato doesn't have a pound of feta cheese.
 - Therefore, Socrates has a new toga and Plato has a quart of olive oil.

Question No 4: (4+4)

- a) Find the values $(A \cap B)^c = A^c \cup B^c$ where Given sets are:

- $A = \{ 1,2 \}$
- $B = \{ 2,3 \}$
- $U = \{ 1,2,3,4 \}$

And Prove the above one using Venn Diagrams and with the help of Membership Table.

- b) Prove the given by using Membership Table:

- (i) $A - (A - B) = A \cap B$
- (ii) $(A \cap B)^c = A^c \cup B^c$
- (iii) $A - B = A \cap B^c$

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