CS & IT ENGINEERING

Discrete Mathematics

Set Theory

DPP 02 Discussion Notes

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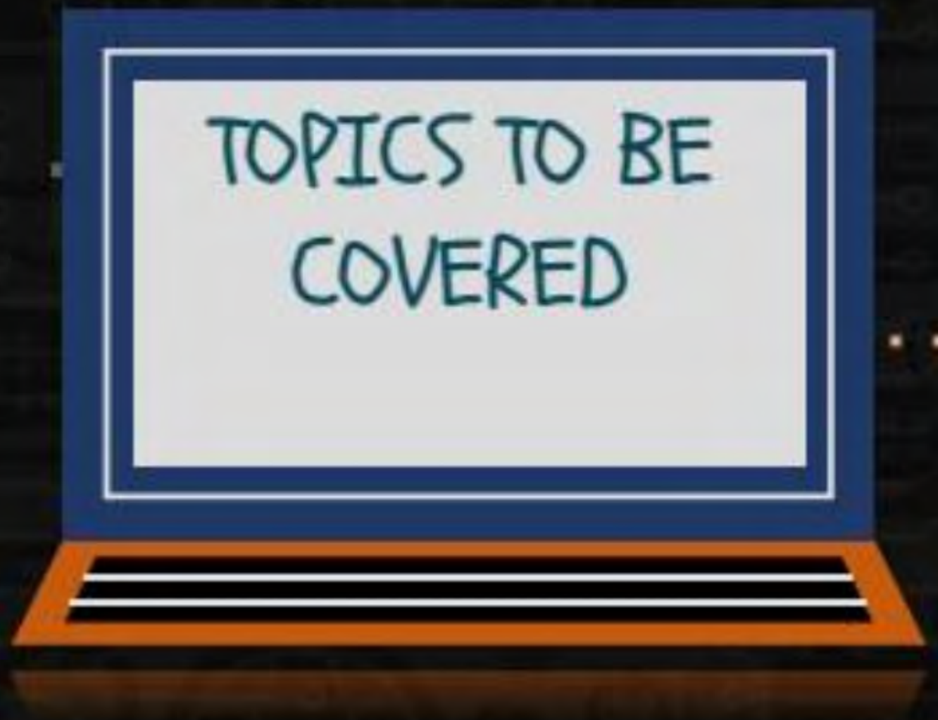


01 Question

02 Discussion

Q.1 Suppose A, B, C and D are subsets of U (the universe) with A as a subset of B and C as subset of D i.e $A \subseteq B$ and $C \subseteq D$, then consider the following statements [MCQ]

I. $A \cap C \subseteq B \cap D$

II. $A \cup C \subseteq B \cup D$

Which of the following is correct options?

A. Only I is true

B. Only II is true

C. Neither I nor II is true

D. Both I and II are true

$A \subseteq B, C \subseteq D$

$U = \{1, 2, 3, 4\}$

I. $A = \{1, 2\}$ $B = \{1, 2, 3\}$

$C = \{2\}$ $D = \{2, 3\}$

$A \cap C = \{2\}$ $B \cap D = \{2, 3\}$

II. $B \cup D = \{1, 2, 3\}$

$A \cup C = \{1, 2\}$

Q.2 Let A = {1, 2, 3, ... 15}. How many subsets of A contains all of the odd integers in A? ~~128~~ [NAT]

Odd integers in A = {1, 3, 5, 7, 9, 11, 13, 15}

These elements must be the part of our set.

Even integers in A: {2, 4, 6, 8, 10, 12, 14}

$\Downarrow$

7 even elements

Subset: { All odd int. } × { Even int. }

7 element.

$2^7 = 128$

{1 ..... 15}.

odd values

① 1, 2 { ... } ddd

② {1, 4 - - } odd

{ {2} {4}, {6}, {8},
{10}, {12}, {14} ...
{2, 4} ... — }

Q.3

Determine whether each of the following statements is true or false. For each false statement, given a counterexample. [MCQ]

3 – False
1 – True

A (Non-negative int) : {0, 1, 2, 3 ...}
B (Non-positive int) : {0, −1, −2, −3 ...}

$A \cap B = \{0\}$: Finite set

A. If A and B are infinite sets, then $A \cap B$ is infinite. — False

B. If B is infinite and $A \subseteq B$, then A is infinite. — False

$A_1 \subseteq B$
$A_1 = \{-1, -2, -3\}$
Finite set.

C. If $A \subseteq B$ with B finite, then A is finite. — True

$A \subseteq B$ (B: Finite)
$B = \{1, 2, 3\}$
$2^3 = 8$

D. If $A \subseteq B$ with A finite, then B is finite. — False

Q.4

Let U be a given universe with $A, B \subseteq U, A \cap B = \phi, |A| = 12$, and $|B| = 10$. If seven elements are selected from $A \cup B$, what is the probability the selection contains four elements from A and three from B?

[NAT]

$A \cup B = 12 + 10 = 22$

\# Set with 7 element : { 4 ele , 3 ele }

4 ele ⇓ A

3 ele ⇓ B

$$= {}^{12}C_4 * {}^{10}C_3$$

$$= 495 * 120$$

$$\text{Prob} : \frac{\text{Fav. cases}}{\text{Total cases}} = \frac{{}^{12}C_4 * {}^{10}C_3}{{}^{22}C_7}$$

$$= \underline{\underline{0.3483}}$$

Q.5 Let $A, B \subseteq \boldsymbol{R}$, where $A = \{x \mid x^2 - 7x = -12\}$ and $B = \{x \mid x^2 - x = 6\}$ Determine $A \cup B$ and $A \cap B$.

[MCQ]

$A \cap B = \{3\}$

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

A. $A \cup B = \{5\}$ and $A \cap B = \{-2, 3, 4\}$ ✗

B. $A \cup B = \{3\}$ and $A \cap B = \{-2, 3, 4\}$ ✗

C. $A \cup B = \{-2, 3, 4\}$ and $A \cap B = \{3\}$

D. $A \cup B = \{2, 3, 4\}$ and $A \cap B = \{5\}$

$A: x^2 - 7x = -12$

$x^2 - 7x + 12 = 0$

$x^2 - 3x - 4x + 12 = 0$

$x(x-3) - 4(x-3) = 0$

$(x-3)(x-4) = 0$

$\therefore x = 3, 4$

B: $x^2 - x = 6$

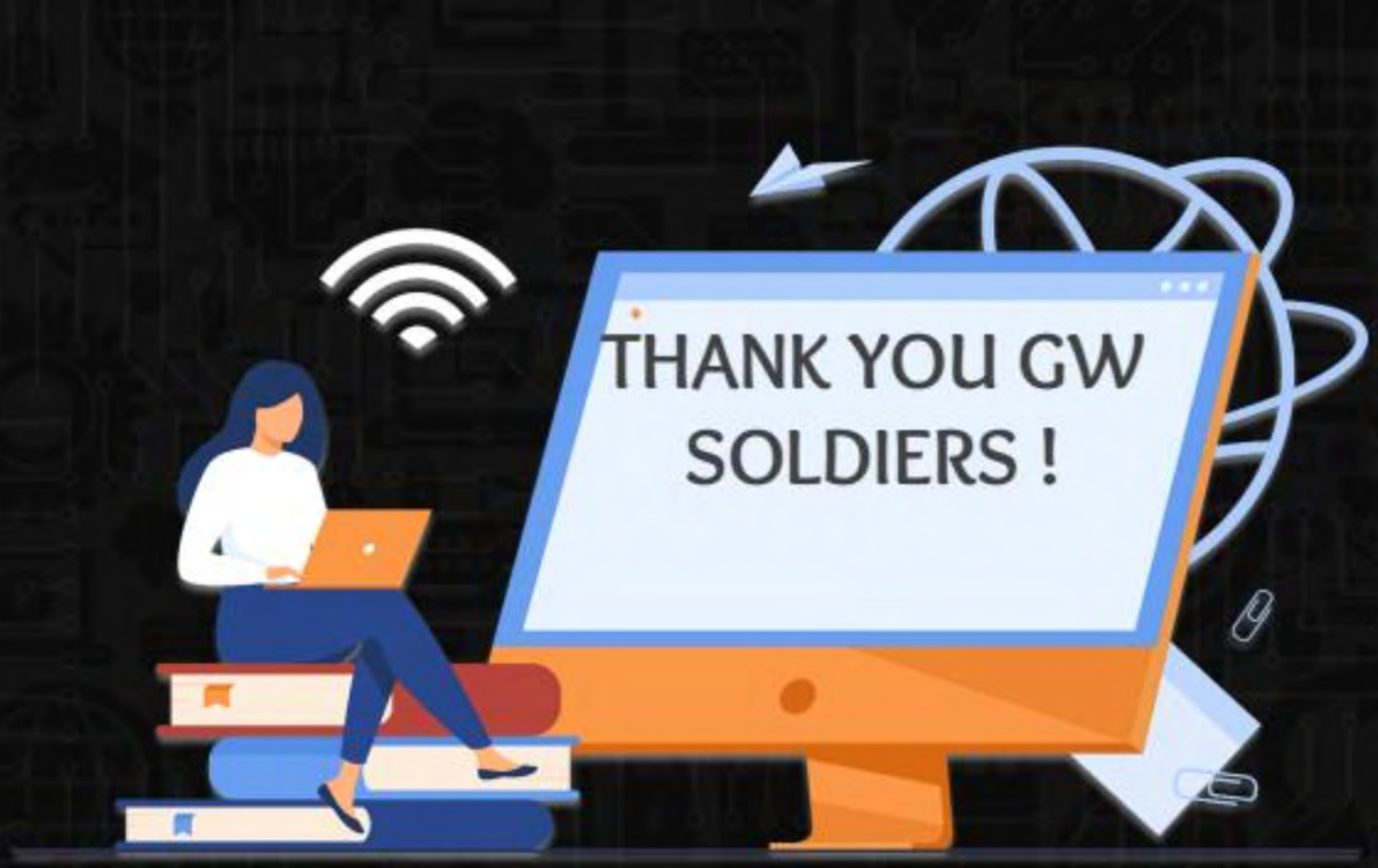
$x^2 - x - 6 = 0$

$x^2 - 3x + 2x - 6 = 0$

$x(x-3) + 2(x-3) = 0$

$(x-3)(x+2) = 0$

$x : 3, -2$


THANK YOU GW
SOLDIERS !