الدرجة
30

Suez Canal University

Faculty of Computers & Informatics

Summer Semester: First Level

Date: 20-8-2023, Time: 1.5h

الاسم كاملا باللغة العربية ____________________

Mid-Term Exam (10/30) + Academic Assignments (20/30)

Mid-Term Exam of Discrete Math for Summer Course (BSD-103)

Module-A **Module-A**

First Question (15 Marks)

- Use mathematical induction to $x^{2n} - y^{2n}$ is divisible by $(x + y)$ for $n \in \{0, 1, 2, \ldots\}$

- For the relation R on $X = \{1, 2, 3, 4\}$ defined by the rule $(x, y) \in R$, $x + 1 \leq y$.

① Find the relation R ② Give the graphical representation

③ Give the matrix representation of R ④ identify that if R is reflexive, symmetric or transitive.

استخدم ظهر الورقة عندما يتطلب الأمر

Second Question (15 Marks)

- Prove that if x^2 is even, then x is even

- Let $S_n = \{kn^2 \mid k = 1, 2, 3\}$, find $\bigcup_{n=1}^{3} S_n$

- Simplify the following statement: $(p \wedge q) \vee (p \wedge \bar{q}) \vee (\bar{p} \wedge \bar{q})$

انتهت الأسئلة

Prof. Yasser M Hamada

Date: Subject: Module - A

first Question

(1)

step 1: $S_n = x^{2n} - y^{2n}$

at $n = 1$, $S_1 = x^2 - y^2 = (x+y)(x-y)$
is divisible by $(x+y)$

at $n = 2$, $S_2 = x^4 - y^4$
$= (x^2+y^2)(x^2-y^2)$
$= (x^2+y^2)(x-y)(x+y)$
is divisible by $(x+y)$

$\therefore S_n = (x^{2n} - y^{2n})$ is divisible by $(x+y)$

step 2: at $n+1$

$S_{(n+1)} = x^{2n+2} - y^{2n+2}$
$= x^2 x^{2n} - y^2 y^{2n}$
$= x^2 x^{2n} - x^2 y^{2n} + x^2 y^{2n} - y^2 y^{2n}$
$= x^2 (x^{2n} - y^{2n}) + y^{2n} (x^2 - y^2)$

By The first step , $S_n = x^{2n} - y^{2n}$ is divisible by $(x+y)$
By The second step , $S_{n+1} = x^2(x^{2n} - y^{2n}) + y^{2n}(x^2 - y^2)$
is also divisible by $(x+y)$

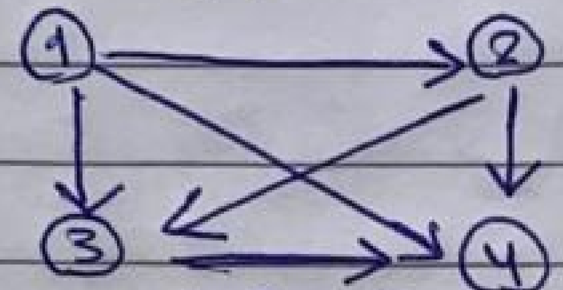
Date: __________ Subject: __________

② $X = \{1, 2, 3, 4\}$ R defined by The rule $(x, y) \in R$

$x + 1 \leq y$

① $R = \{(1,2), (1,3), (1,4), (2,3), (2,4), (3,4)\}$

②



③

$$M_R = \begin{array}{c|cccc} & 1 & 2 & 3 & 4 \\ \hline 1 & 0 & 1 & 1 & 1 \\ 2 & 0 & 0 & 1 & 1 \\ 3 & 0 & 0 & 0 & 1 \\ 4 & 0 & 0 & 0 & 0 \end{array}$$

④ R is not reflexive, not symmetric, Transitive

Date: Subject:

second Question

(1)

$P: x^2$ is even number

$q: x$ is also even number

if $\bar{q}$: x is odd number

$$x = 2k + 1$$

$$x^2 = (2k+1)^2 = 4k^2 + 4k + 1 = 2(2k^2 + 2k) + 1$$

Then x^2 is odd number

This mean That, if x^2 is even, Then x is even

(2) $S_1 = \{k / k = 1,2,3\} = \{1,2,3\}$

$S_2 = \{4k / k = 1,2,3\} = \{4, 8, 12\}$

$S_3 = \{6k / k = 1,2,3\} = \{6, 12, 18\}$

$$\bigcup_{n=1}^{3} = S_1 \cup S_2 \cup S_3 = \{1,2,3,4,6,8,12,18\}$$

③ simplify $(p \wedge q) \vee (p \wedge \bar{q}) \vee (\bar{p} \wedge \bar{q})$

$(p \wedge q) \vee (p \wedge \bar{q}) \vee (\bar{p} \wedge \bar{q})$

$\equiv p \wedge (q \vee \bar{q}) \vee (\bar{p} \wedge \bar{q})$

$\equiv (p \wedge T) \vee (\bar{p} \wedge \bar{q})$

$\equiv p \vee (\bar{p} \wedge \bar{q})$

$\equiv (p \vee \bar{p}) \vee (p \vee \bar{q})$

$\equiv T \vee (p \vee \bar{q})$

$\equiv p \vee \bar{q}$ #