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BRAC University
Department of Computer Science and Engineering (CSE)
CSE230: Discrete Mathematics

SET - A

Semester: Spring 2024
Examination: Quiz 3

Time: 20 minutes
Full marks: 20

Name: ____________________ ID: ____________________ Section: _____

*(There are 2 questions total. You must answer **both**.*
Feel free to use the back of the question paper, if needed.)

Q1. Use any proof technique to show that for $m \in \mathbf{Z}^+$, if m is odd, then m is the difference of two squares (Example: $1 = 1^2 - 0^2$, $3 = 2^2 - 1^2$, $11 = 6^2 - 5^2$).

[10 Marks]

Q2. Prove that if $m + n$ and $n + p$ are odd integers, where m, n and p are integers, then $m + p$ is even.

[10 Marks]

End

Q1. ~~Assuming~~ $P(x)$:= 'x is odd', $Q(x)$:= 'x is diff... of squares'
where domain is $\mathbb{Z}^+$
Assuming, $P(x) \equiv T$, $x = 2k+1$, where k is integer.
$\Rightarrow x = k^2 + 2k + 1 - k^2 = (k+1)^2 - k^2$
$\Rightarrow Q(x) \equiv T$
Proved.

Q2. $P(m,n,p)$:= 'm+n is odd and n+p is odd.'
$Q(m,n,p)$:= 'm+p is even'
where domain is $\mathbb{Z}$.

Assuming $P(m,n,p) \equiv T$, m+n is odd and n+p is odd.
so, $(m+n) + (n+p)$ = odd + odd
$\therefore m + 2n + p$ = even, since odd + odd = even.
$\therefore m + p$ = even $- 2n$ = even − even = even,
since even − even = even.

$\therefore Q(m,n,p) \equiv T$.
Proved