<table>
<tr><td></td><td>BCM SCHOOL BASANT AVENUE DUGRI ROAD LUDHIANA
ASSIGNMENT ANSWER KEY
(RELATION AND FUNCTIONS)
CLASS XII SC</td></tr>
<tr><td>1</td><td>A</td></tr>
<tr><td>2</td><td>C</td></tr>
<tr><td>3</td><td>Assertion is true, reason is false</td></tr>
<tr><td>4</td><td>Given, f(x) = |x| + x and g(x) = |x| − x, ∀ x ∈ R.
$$\Rightarrow \quad f(x) = \begin{cases} x + x, & x \geq 0 \\ -x + x, & x < 0 \end{cases}$$
$$\text{and} \quad g(x) = \begin{cases} x - x, & x \geq 0 \\ -x - x, & x < 0 \end{cases}$$
$$\Rightarrow f(x) = \begin{cases} 2x, & x \geq 0 \\ 0, & x < 0 \end{cases} \text{and} \quad g(x) = \begin{cases} 0, & x \geq 0 \\ -2x, & x < 0 \end{cases}$$
Thus, for x ≥ 0,gof (x) = g(f(x)) = g(2x) = 0
and for x < 0, gof(x) = g(f(x)) = g(0) = 0 ⇒ gof(x) = 0, ∀ x ∈ R Similarly, for x > 0, fog (x) = f(g(x)) = f(0) = 0
and for x < 0, fog (x) = f(g(x)) = f(-2x)
= 2(-2x) = -4x
$$\Rightarrow fog\,(x) = \begin{cases} 0, & x \geq 0 \\ -4x, & x < 0 \end{cases}$$
We have, gof(x) = 0, ∀ x ∈ R.
$$\text{and } fog(x) = \begin{cases} 0, & x>0 \\ -4x, & x<0 \end{cases}$$
Clearly, fg(-3) = -4(-3) = 12,
fog(5) = 0 and gof(-2) = 0</td></tr>
<tr><td>5</td><td>R is Reflexive if (a, b) R (a, b) for (a, b) in N × N
Let (a, b) R (a, b) ⇒ a + b = b + a which is true since addition is commutative on N. ⇒
R is reflexive.
R is Symmetric if (a, b) R (c, d) ⇒ (c, d) R (a, b) for (a, b), (c, d) in N × N
Let (a, b) R (c, d)
⇒ a + d = b + c
⇒ b + c = a + d
⇒ c + b = d + a [since addition is commutative on N]
⇒ (c, d) R (a, b)
⇒ R is symmetric.
R is Transitive if (a, b) R (c, d) and (c, d) R (e, f) ⇒ (a, b) R (e, f)</td></tr>
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	for (a, b), (c, d),(e, f) in N × N Let (a, b) R (c, d) and (c, d) R (e, f) ⇒ a + d = b + c and c + f = d + e ⇒ (a + d) – (d + e) = (b + c) – (c + f) ⇒ a - e = b - f ⇒ a + f = b + e ⇒ (a, b) R (e, f) ⇒ R is transitive.
6	gof (x) = $g\left(\frac{3x+4}{5x+7}\right)=\frac{7\left(\frac{3x+4}{5x+7}\right)+4}{5\left(\frac{3x+4}{5x+7}\right)-3}=x$ $fog(x)=f\left(\frac{3x+4}{5x-3}\right)=\frac{3\left(\frac{7x+4}{5x-3}\right)+4}{5\left(\frac{7x+4}{5x-3}\right)-7}=x$ *Thus* gof(x) = x, for all x ∈ B fog (x) = x, for all x ∈ A Which implies that gof = IB And Fog = IA
7	and $f(x_1)=f(x_2)$ $\frac{x_1}{1+x_1^2}=\frac{x_2}{1+x_2^2}$ $x_1(1+x_2^2)=x_2(1+x_1^2)$ $x_1+x_1.x_2^2-x_2-x_2x_1^2=0$ $(x_1-x_2).(x_1.x_2-1)=0$ Taking $x_1=4,\ x_2=\frac{1}{4}\in R.$ ∴ *f* is not one-one. **(ii) *f* is onto :** Let $y \in R$ (co-domain) $f(x)=y$ $\Rightarrow \frac{x}{1+x^2}=y \Rightarrow y.(1+x^2)=x$ $\Rightarrow yx^2+y-x=0$ $\Rightarrow x=\frac{1\pm\sqrt{1-4y^2}}{2y}$ since, $x \in R$, ∴ $1-4y^2 \geq 0$ $\Rightarrow (1+2y)(1-2y)\geq 0$ $\therefore -\frac{1}{2}\leq y<\frac{1}{2}$ So Range $(f) \in \left[-\frac{1}{2},\frac{1}{2}\right]$ Range $(f) \neq R$ (Co-domain) ∴ *f* is not onto.

8	**One-One :** Let $x_1, x_2 \in R$ Such that $f(x_1) = f(x_2)$ or $\frac{x}{1+\|x_1\|} = \frac{x_2}{1+\|x_2\|}$ **Case (i) :** If $x_1, x_2 < 0$ then $\frac{x_1}{1-x_1} = \frac{x_2}{1-x_2}$ or $x_1 - x_1x_2 = x_2 - x_1x_2$ or $x_1 = x_2$ **Case (ii) :** If $x_1, x_2 > 0$ then $\frac{x_1}{1+x_1} = \frac{x_2}{1+x_2}$ $x_1 + x_1x_2 = x_2 + x_1x_2$ or $x_1 = x_2$ **Case (iii) :** If $x_1 > 0, x_2 < 0$ (Similarly for $x_1 < 0, x_2 > 0$) or $\frac{x_1}{1+\|x_1\|} \neq \frac{x_2}{1-\|x_2\|}$ $x_1 \neq x_2$ or $f(x_1) \neq f(x_2)$ ∴ From (i), (ii) & (iii) f is a one-one function. **Onto :** Let any $y \in \{x \in R: -1 < x < 1\}$ $(\because -1 < y < 1)$ Such that $y = f(x)$ or $y = \frac{x}{1+\|x\|}$ 1 or $y = \frac{x}{1 \pm x}$ or $x = \frac{y}{1 \pm y}$ As $y \neq -1,\ y \neq 1$ ∴ $x = \frac{y}{1 \pm y} \in R$ 1 ∴ f is an onto function. $f^{-1}(x) = \begin{cases} \frac{x}{1+x}, & \text{if } x < 0 \\ \frac{x}{1-x}, & \text{if } x \geq 0 \end{cases}$
9	**fing gof and fog**
10	**(i)** 6^2 **(ii)** **(d) None of these three** **(iii)** **Reflexive and Transitive** **(iv)** 2^{12}