SETS, RELATIONS & FUNCTIONS - SET 4

1. Consider the following statements : (a) The product of two even or odd function is an even function.
   (b) The product of an even function and an odd function is an odd function
   (c) Every function can be expressed as the sum of an even and an odd function.
   Which of the statements given above is / are correct

   (a) only a
   (b) only b
   (c) only c
   (d) all of the above

2. If A = $\{x : f(x) = 0\}$ and B = $\{x : g(x) = 0\}$ then $A \cap B$ will be :

   (a) $[f(x)]^2 + [g(x)]^2 = 0$
   (b) $\frac{f(x)}{g(x)}$
   (c) $\frac{g(x)}{f(x)}$
   (d) none of these

3. In a certain town 25% families own a phone and 15% own a car, 65% families own neither a phone nor a car, 2000 families own both a car and a phone. Consider the following statements in this regard :
   (a) 10% families own both a car and a phone
   (b) 35% families own either a car or a phone
   (c) 40000 families live in town
   Which of the above statements are correct

   (a) a and b
   (b) a and c
   (c) b and c
   (d) all the above

4. Let N denotes the set of all natural numbers and R be the relation on $N \times N$ defined by (a,b)R(c,d) if ad(b+c)=bc(a+d), then R is ;

   (a) symmetric only
   (b) reflexive only
   (c) transitive
   (d) an equivalence relation

5. The solution set of $8x \equiv 6(mod 14), x \in Z$ are

   (a) $[8] \cup [6]$
   (b) $[8] \cup [14]$
   (c) $[6] \cup [13]$
   (d) $[8] \cup [6] \cup [13]$

6. Let L be the set of all straight lines in the Euclidean plane. Two lines l_1 and l_2 are said to be related by the relation R, iff l_1 is parallel to l_2. Then the relation R is

   (a) reflexive

(b) symmetric

(c) transitive

(d) equivalence

7. Let A = $\{x :\in R, |x| < 1\}$; B = $\{x :\in R, |x| < 1\}$; and $A \cup B = R - D$, then the set D is :

   (a) $\{x : 1 < x \leq 2\}$

   (b) $\{x : 1 \leq x < 2\}$

   (c) $\{x : 1 \leq x \leq 2\}$

   (d) none of these

8. If X = $\{4^n - 3n - 1 : n \in N\}$ and Y = $\{9(n-1) : n \in N\}$, then $X \cup Y$

   (a) X

   (b) Y

   (c) N

   (d) none of these

9. The number of elements in the set $\{(a, b) : 2a^2 + 3b^2 = 35, a, b \in Z\}$ where Z is the set of all integers, is :

   (a) 2

   (b) 4

   (c) 8

   (d) 12

10. If A = $\{x : x$ is a multiple of 4$\}$ and B = $\{x : x$ is a multiple of 6$\}$, then $A \cap B$ consists of all multiples of :

    (a) 16

    (b) 12

    (c) 8

    (d) 4

11. Consider the following relation : $A - B = A - (A \cap B)$; $A = (A \cap B) \cup (A - B)$ $A - (B \cup C) = (A - B) \cup (A - C)$ Which of the above statements is/are correct :

    (a) a and b

    (b) b only

    (c) b and c

    (d) a and b

12. The relation R = $\{(1,1), (2,2), (3,3), (1,2), (2,3), (1,3)\}$ on set A =$\{1, 2, 3\}$ is

    (a) reflexive but not symmetric

    (b) reflexive but not transitive

    (c) symmetric and transitive

    (d) neither symmetric nor transitive

13. The relation "less than" in the set of natural numbers is

(a) only symmetric

(b) only transitive

(c) only reflexive

(d) equivalence relation

14. Let R be a relation on N defined by x +2y=8. The domain of R is :

(a) $\{2, 4, 8\}$

(b) $\{2, 4, 6, 8\}$

(c) $\{2, 4, 6\}$

(d) $\{1, 2, 3, 4\}$

15. If R = $\{(x, y)|x, y \in Z, x^2 + y^2 \leq 4\}$ is a relation in Z, then domain of R is :

(a) $\{0, 1, 2\}$

(b) $\{0, -1, -2\}$

(c) $\{-2, -1, 0, 1, 2\}$

(d) none of these

16. The relation "is a subset of" on the power set P(A) of set A is :

(a) symmetric

(b) anti symmetric

(c) equivalence

(d) none of these

17. If X = $\{8^n - 7n - 1 : n \in N\}$ and Y = $\{49(n - 1) : n \in N\}$ then

(a) $X \subseteq Y$

(b) $Y \subseteq X$

(c) $X = Y$

(d) none of these

SET 4 - TRUE/FALSE AND FUNCTION PROPERTIES

1. If f(x) =(a$-x^n)^{\frac{1}{n}}$ where $a > 0$ and n is a positive integer, then $f[f(x)] = x$

2. The function $f(x) = \frac{x^2+4x+30}{x^2-8x+18}$ is not one to one.

3. If $f_1(x)$ and $f_2(x)$ are defined on domains D_1 and D_2 respectively, then $f_1(x) + f_2(x)$ is defined on $D_1 \cup D_2$

4. Which of the following function is periodic:

(a) $f(x) = x - [x]$ where [x] denotes the greatest integer less than or equal to the real number x.

(b) $f(x) = sin\frac{1}{x}$ for $x \neq 0$, f(0)=0

(c) f(x) = xcosx

(d) none of these

5. For real x, the function $\frac{(x-a)(x-b)}{(x-c)}$ will assume all real values provided :

(a) $a > b > c$

(b) $a < b < c$

(c) $a > c < b$

(d) $a \leq c \leq b$

6. Let f(x) $= \frac{\alpha x}{x+1}, x \neq -1$. Then for what value of α is $f[f(x)] = x$

(a) $\sqrt{2}$

(b) $-\sqrt{2}$

(c) 1

(d) -1

7. Suppose f(x) $= (x+1)^2$ for $x \geq -1$. If g(x) is the function whose graph is reflection of the graph of f(x) with respect to the line y =x, then g(x) equals :

(a) $-\sqrt{x} - 1, x \geq 0$

(b) $\frac{1}{(x+1)^2}, x > -1$

(c) $\sqrt{x+1}, x \geq -1$

(d) $\sqrt{x} - 1, x \geq 0$