MCQ on set theory

Q.1 . Which of the following are well-defined sets?
1. All the colors in the rainbow.
2. All the points that lie on a straight line.
3. All the honest members in the family.
4. All the efficient doctors of the hospital.
5. All the hardworking teachers in a school.
6. All the prime numbers less than 100.

Q. 2. Write the following sets in the set builder form.
1. A = {2, 4, 6, 8}
2. B = {3, 9, 27, 81}
3. C = {1, 4, 9, 16, 25}
4. D = {1, 3, 5, ...}
5. E = {4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, ..., 52}
6. F = {-10, ..., -3, -2, -1, 0, 1, 2, ..., 5}
7. G = {O}
8. P = { }

Q. 3. Write the following sets in the roster form.

1. A = {x : x $\in$ W, x $\leq$ 5}
2. B = {x : x $\in$ I, -3 < x < 3)
3. C = {x : x is divisible by 12}
4. D = {x : x = 3p, p $\in$ W, p $\leq$ 3}
5. E = {x : x = a2, a $\in$ N, 3 < a < 7}
6. F = {x : x = n/(n + 1), n $\in$ N and n $\leq$ 4}

Q.4. Which of the following are the examples of an empty set?

1. The set of even natural numbers divisible by 3.
2. The set of all prime numbers divisible by 2.
3. {x : x $\in$ N, 5 < x < 6}
4. The set of odd natural numbers divisible by 2.
5. P = {x : x is a prime number, 54 < x < 58}
6. Q = {x : x = 2n + 3, n $\in$ W, n $\leq$ 5}

Q. 5. Classify the following as finite and infinite sets.

1. The set of days in a week
2. A = {x : x $\in$ N x > 1}
3. B = {x : x is an even prime number}
4. D = {x : x is a factor of 30}
5. P = {x : x $\in$ Z, x < -1}

Q.6 The set A={x, x$\in$N , and x^2-3x+2 = 0} is
1. Null set
2. Finite set
3. Infinite set
4. None of these

Q.7 The set A={x, x∈R , and $x^2=9$, 2x = 4} is
1. Empty set
2. Singleton set
3. Infinite set
4. None of these

Q. 8 Let A= {x: x is a letter in the word FOLLOW}, B= {y: y is a letter in the word WOLF}

1. A & B are disjoint
2. A=B
3. A≠B
4. None of these

Q.9 Are the following pairs of sets equal?

1. A = {2}   B = {x : x ∈ N, x is an even prime number}.
2. P = {1, 4, 9}   Q = {x : x = n2, n ∈ N, n ≤ 3)
3. X = {x : x ∈ W, x < 5}   Y = {x : x ∈ N, x ≤ 5}
4. M = {a, b, c, d}   N = {p, q, r, s}
5. D = {x : x is a multiple of 30}   E = {x : x is a factor of 10}

Q.10. Which of the following are equivalent sets?

1. A = {1, 2, 3}   B = {4, 5}
2. P = {q, s, m}   Q = {6, 9, 12}
3. X = {x : x is a prime number less than 10}   Y = {x : x ∈ N, x ≤ 4}
4. R = {x : x = 2n + 3, n < 4, n ∈ N}   S = {x : x = n/(n + 1), n ∈ R, n ≤ 4}
5. The set of vowels in the English alphabet
6. The set of consonants in the English alphabet

Q.11 . Find the cardinal number of the following sets.

1. A = {x : x ∈ I, 2 < x < 7}
2. B = {x : n ∈ N, x = n2, n < 3}
3. The set of months in a year
4. C = {x : x ∈ Z+, x < 100}
5. D = {x : x = n3, n ∈ W, n < 5}
6. The set of letters in the word MALAYALAM

Q.12 State whether true or false:

1. {5, 7, 9} = {9, 7, 5}
2. Sets {4, 9, 6, 2} and {6, 2, 4, 9} are not same.
3. Sets {0, 1, 3, 9, 4} and {4, 0, 1, 3, 9} are same.
4. {a, b, c, c, d} = {a, b, c}
5. {2, 3, 3, 4, 4} = {2, 3, 4}
6. Sets {5, 4} and {5, 4, 4, 5} are not same.
7. Sets {8, 3} and {3, 3, 8} are same.
8. {x | x is a vowel in the word 'equation'}
9 . If M is the set of letters used in the word 'KOLKATA'; then M = {k, o, l, a t}.

Q.13 . Write each of the following sets in the shortest possible way:

1. {2, 7, 7, 2, 3, 7, 8}
2. {10 - 5, 20 - 15, 30 - 25, 40 - 35, 37 - 32}
3. {2 + 8, 3 + 7, 4 + 6, 5 + 5, 6 + 4, 7 + 3}
4. 3, 5, 15, 45, 75 and 90

Q.14 Let A = set of natural numbers less than 8, B = {even natural numbers less than 12}   C = {Multiples of 3 between 5 and 15},and   D = {Multiples of 4 greater than 6 and less than 20}; Find:

1. (B ∩ D) B ∪ C
2. A ∪ D
3. C ∪ D
4. A ∩ C
5. (B ∩ C) ∪ A
6. (D ∪ A) ∩ B
7. (A ∩ C) ∪
8. (B ∪ D) ∩ (C ∪ A)

Q. 15 If A {5, 7, 8, 9}, B = {3, 4, 5, 6} and C = {2, 4, 6, 8, 10}; where n is total number of distinct elements in a set.   Find:

1. n(A) + n(B)
2. n(A ∪ B)
3. n(A ∩ B)
4. n(A ∪ B) + n(A ∩ B)
5. n(B) + n(C) − n(B ∩ C)
6. n(A) + n(B) = n(A ∪ B) + n(A ∩ B)?
7. Is n(B ∪ C) = n(B) + n(C) - n(B ∩ C)?

Q.16 Find the cardinal number of the following sets:

1. { }
2. {0}
3. {3, 7, 11, 15}
4. {3, 3, 3, 4, 4, 5}
5. {x : x is a letter in the word 'STATISTICS'}
6. {x : x is an odd whole number less than 12}
7. {x : x ∈ N and x2 < 50}
8. {x : x is a factor of 12}

Q. 17 Show by Venn diagrams the relationship between the following pairs of sets:

1. X = {letters of English alphabet upto 'h'};   Y = {all the vowels of English alphabet}
2. A = {even numbers less than 10};   B = {odd numbers less than 10}
3. C = {multiple of 5 less than 30};   D = {multiple of 3 less than 20}
4. M = {all girls of your school};   N = {all boys of your school}
5. P = {boys who play hockey};   Q = {boys who play cricket}
6.. R = {people who speak Hindi};   S = {people who speak Tamil}
7. U = {people who live in India};   V = {people who live in Bihar}
8. E = {men};   F = {kings}
9. (ix) S = {all animals};   T = {people who wear shirts}

Q.18. . **If: A = Set of natural numbers, B = Set of prime numbers and C = Set of even prime numbers**

   Draw Venn-diagram showing the relationship among the given sets A, B and C.

Q.19 . Let M = {Natural numbers between 10 and 40; each divisible by 3}
   N = {Natural numbers upto 40; each divisible by 4}.

 Draw a Venn-diagram showing the relationship between sets M and set N.

Q. 20 . **Show by Venn diagrams the relationship between the following pairs of sets:**
   If: A = Set of natural numbers, B = Set of prime numbers and
      C = Set of even prime numbers.

Draw Venn-diagram showing the relationship among the given sets A, B and C.

Q. 21 Let M = {Natural numbers between 10 and 40; each divisible by 3}
   N = {Natural numbers upto 40; each divisible by 4}.

   Draw a Venn-diagram showing the relationship between sets M and set N.

Q. 22 If A $\cap$ B^c = $\emptyset$

   1.   A = B
   2.   B$\neq$ A
   3.   A is proper subset of B
   4.   None of these

Q.23 A^c - B^c is equal to

   1.   B-A
   2.   A-B
   3.   A= B
   4.   None of these

Q. 24 If A = $\emptyset$ **then total number of elements in P(A) are**

   1.   No element
   2.   Zero
   3.   two
   4.   one

Q. 25 Let A= { a,b,c} and B= { 1,2} then the number of relations from A into B are
   1. 6
   2. 5
   3. 32
   4. 64

Q. 26 Let R is the set of all triangles in a plane aRb iff a is congruent to b , then R is
   1.   Only reflexive
   2.   Only Symmetric
   3.   Only Transitive relation
   4.   Equivalence relation

Q. 27 The relation " is parallel" on the set A of all coplanar straight line is :

   1.   Only reflexive

2.   Only Symmetric
3.   Only Transitive relation
4.   Equivalence relation

Q. 28 Let A= {a,b,c} and R= {(b,b), (c,a),(a,c)} , then the relation R on A is
1.   Only reflexive
2.   Only Symmetric
3.   Only Transitive relation
4.   None of these.

Q.29 The relation " congruence modulo m" is
1.   An equivalence
2.   Reflexive only
3 . Symmetric only
4.   Transitive only

Q.30 If aN= { ax, x∈ N, } then the set 3N∩ 7N is equal to
1.   7N
2.   3N
3. 21N
4. Ø

Q. 31 A set has n elements , then the total number of subsets are
1. 2^n
2. 2^{n-1}
3. 2^{2n}
4.   None of these

Q.32 **A set has n elements , then the total number of proper subsets are**
1. 2^n
2. 2^{n-1}
3. 2^{2n}
4.   None of these

Q.33 The sets A& B have 6 & 9 elements respectively, such that A is proper subset B , then the total number of elements A ∩ B are
1.   6
2.   9
3.   3
4.   15

Q.34 The sets A& B have 5 & 9 elements respectively, such that A is proper subset B , then the total number of elements A ∪ B are

1.   5
2.   9
3.   14
4.   4

Q.35 The smallest set A such that A∪{4,5}= {1,2,3,4,5} is

1. {3,4,5}
2. {1.2.3}
3. {1,2}
4. { 1,2,3,4,5}

Q. 36 Let X is a finite set containing n distinct elements , then total number of relation on X are equal to

1. 2^n
2. 2^{n-1}
3. 2^{2n}
4. 2^{n^2}

Q. 37 Which set is the subsets of all given sets

1. $\{1\}$
2. $\{0\}$
3. $\emptyset$
4. $\{0,1,6.7\}$

Q.38 If A= $\{$ 1,2,3$\}$ & B= $\{$ 4,5,6$\}$ then , n(A$\times$ B) is equal to

1. 6
2. 9
3. 27
4. None of these

Q. 39 The number of relation that can be defined on the set A= $\{$a,b,c$\}$ are

1. 2^9
2. 2^3
3. 9^2
4. 9

Q. 40 Let X= $\{$1,2.3$\}$ then the relation R= $\{$(1,1),(2,2),(3,1)$\}$ on X is

1. Reflexive
2. Symmetric
3. Transitive
4. None of these

Q. 41 Let X & Y are two finite sets s.t. O(X) = m & O(Y) = n then the number of relations from X to Y are
1. 2^{m+n}
2. m+n
3. mn
4. 2^{mn}

Q.42 If A & B are two sets such that n(A)= 15, n(B)= 21, & n(A∪B) = 36 then n(A∩B) equal to
   1. 2
   2. 0
   3. 4
   4. 15

Q.43 If P & Q are two sets such that P ∪ Q has 20 elements , P has 9 elements & Q has 16 elements . How many elements does P∩Q have ?
   1.   5
   2.   4
   3.   3
   4.   0

Q. 44 In a Group of 300 people , 150 can speak French & 200 can speak German. How many can speak both French & German.
   1.   40
   2.   50
   3.   20
   4.   None of these

Q.45 The relation R defined on the set of natural numbers as {(a, b): a differs from *b* by 3} is given
   1. {(1, 4), (2, 5), (3, 6), ….}
   2. { (4, 1), (5, 2), (6, 3), ….}
   3.   {(4, 1), (5, 2), (6, 3), ….}
   4.   None of the above

Q.46. The relation R defined on the set A = {1, 2, 3, 4, 5} by R = {(x, y) : | x² – y²| < 16} is given by

   1.   {(1, 1), (2, 1), (3, 1), (4, 1), (2, 3)}
   2.   {(2, 2), (3, 2), (4, 2), (2, 4)}
   3. {(3, 3), (4, 3), (5, 4), (3, 4)}
   4.   None of the above

Q.47   If the binary operation * is defined on a set of ordered pairs of real number as (a,b)*(c,d)= (ad+bc, bd) and is associative then (1,2)*(3,5)*(3,4) equals

   1. (74,40)
   2. (32,40)
   3. (23,11)
   4.   (7,11)

Q.48 If A = {1,2,3,4} . let ~ = {(1,2),(1,3),(4,2)}. Then ~ is
   1.   Not anti-symmetric
   2. Transitive
   3. Reflexive
   4. Symmetric

Q.49 If R ={ (1,2),(2,3),(3,3)} be a relation defined on A= {1,2,3} then R = R^2 is

1. R itself
2. { (1,2),(2,3),(3,3)}
3. { (1,3),(2,3),(3,3)}
4. { (2,1),(1,3),(2,3)}

Q.50 A binary opearion * on a set of integers is defined as $x*y = x^2+y^2$ .Which one of the following statement is true about *
1. Commutative but not associative
2. Both Commutative and associative
3. Not Commutative but associative
4. Neither Commutative nor associative

Q.51 How many onto (surjective) functions are there form an n-element(n≥2) set to a 2-elment set ?
1. 2^n
2. $2^n -1$
3. $2^n -2$
4. $2(2^n -2)$

Q. 52 What is the possible number of reflexive relations on a set of 5 elements
1. 2^{10}
2. 2^{15}
3. 2^{20}
4. 2^{25}

Q.53 Consider the binary relation R = {(x,y),(x,z),(z,x),(z,y)} on the set {x,y,z} , which one of the following is true
1. R is symmetric but Not antisymmetric
2. R is not symmetric but antisymmetric
3. R is both symmetric and antisymmetric
4. R is neither symmetric nor antisymmetric

Q.54 For a set A , the power set of A is denoted by 2^A. If A= {5, {6},{7}} , which of the following option are true ?
1. $\emptyset \in 2^A$
2. $\emptyset \subseteq 2^A$
3. {5,{6}}$\in 2^A$
4. . {5,{6}}$\subseteq 2^A$

Q.55 If f is a function from A to B , where O(A) = m & O(B)= n , then total number of distinct functions are
1. nm
2. n^m
3. m^n
4. m+n

Q.56 A function f from N to N defined by f(n)= 2n+5 $\forall n \in n$ is
1. many –one function
2. into function
3. onto function
4. bijective function

Q.57 If 63% of persons like banana , where 76% like apple. What can be said about the percentage of persons who like both banana & apples ?

1. 40
2. 39
3. 27
4. 24

Q.58 The number of binary relation on a set with n elements is

1. n^2
2. 2^n
3. 2^{n^2}
4. None of these

Q.59 The number of equivalence relations of the set {1,2,3,4} is

1. 4
2. 15
3. 16
4. 24

Q.60 Let A be a finite set of size n , the number of elements in the power set of A×A is

1. 2^{2^n}
2. 2^{n^2}
3. 2^n
4. None of these

Q.61 Which of the following set(s) are empty ?

1. {x: x = x}
2. {x: $x \neq x$}
3. {x: x = x²}
4. {x: x ≠ x²}

Q. 62 If A = {x,y} , the power set of A is

1. {{x},{y}}
2. { {Ø}, {x,y}}
3. {Ø,{x},{y}}
4. None of these

Q.63 If A & B are sets and A ∩ B = A ∪ B , then

1. A = Ø
2. B = Ø
3. A = B
4. None of these

Q.64 The domain & range are same for

1. constant function
2. Identity function
3. absolute value function
4. Greatest integer function

Q.65 Set A has 3 elements & set B has 4 elements . The number of injections that can be defined from A into B
   1. 144
   2. 12
   3. 24
   4. 64

Q.66 The number of bijective functions from set A to itself when A contains 106 elements is Is
   1. 106
   2. 106^2
   3. 106 !
   4. 2^{106}

Q.67 Let Z denote the set of all integers define $f : Z \rightarrow Z$ by f(x)= x/2 , if x is even
                                                                        x , if x is odd   then f is
   1. Onto but not one-one
   2. One-one but not onto
   3. One-one & onto
   4. Neither one-one nor onto

Q.68 To have inverse for the function f, f is
   1. one one
   2. onto
   3. one one onto
   4. identity function

Q.69 If [x] denotes integral part of the real number, then the function f(x)= x-[x] is a/an
   1. even function
   2. odd function
   3. periodic function
   4. constant

Q.70 The set of all equivalence classes of a set A of cardinality C
   1. Has the same cardinality as A
   2. forms a partition of A
   3. is if cardinality 2C
   4. is of cardinality C^2

Q.71 In a group of 72 students , 47 have background is electronics , 59 have background in Mathematics & 42 have background in both the subjects. How many subjects do not have background in any of the subjects
   1. 8
   2. 13
   3. 25
   4. 34

Q.72 The function f : Z→ Z given by f(x)= x^2 is
   1. one one
   2. onto
   3. one one & onto
   4. None of these

Q.73 Let A = {x : -1<x<1} = B . The function f(x)= x/2 from A to B is
   1. Injective
   2. surjective
   3. Both Injective & Surjective
   4. Neither Injective nor Surjective

Q.74   A-(B∪C) is equal to
   1. (A-B) ∪ (A-C)
   2. A-B-C
   3. (A-B)∩ (A-C)
   4. (A-B) ∪ C

Q.75 The range of f(x)= [cosx] is
   1. {-1,1}
   2. [-1,1]
   3. { -1, 0,1}
   4. {-1,1}

Q.76 The range of the function f(x)= sin[x] , $\pi/4 < x < \pi/4$

   1. {-1,0,1}
   2. {-1,1}
   3. {-1/√2 ,1/√2 }
   4. {0, -sin 1}

Q.77 The domain of the function , f(x)= 1/($\sqrt{(x - [x])}$) is
   1. R$^+$
   2. R$^-$
   3. Z
   4. R-Z

Q.78 If f: R→ R is defined by f(x) = x²+1 , then value of f⁻¹(17) is
   1. {-2,2}
   2. {-3,3}
   3. { -4,4}
   4. { √17,1}

Q.79 The domain of $\sqrt{x - 4}/(x - 3)$ is .
   1. (-∞, 3) ∪ (4, ∞)
   2. (-∞, 3] ∪ [4, ∞)
   3. (-∞, 3] ∪ (4, ∞)
   4. None of these

Q.80 Find the domain of function f defined by f (x) = -1 / (x + 3) is

   1. (-∞, −3) ∪ (−3, ∞)
   2. (-∞, −3] ∪ [3, ∞)
   3. (-∞, 3] ∪ (3, ∞)
   4. None of these

Q.81 Let X & Y be finite sets and f:X→Y be a function. Which one of the following statement is true

1. For any subsets A & B of X , $|f(A \cup B| = |f(A|+= |f(B|)$
2. For any subsets A & B of X , $f(A \cap B) = f(A) \cap f(B)$
3. For any subsets A & B of X , $|f(A \cap B| = min(|f(A|, |f(B|)$
4. For any subsets A & B of X , $f^{-1}(A \cap B) = f^{-1}(A) \cap f^{-1}(B)$

Q.82 Consider the set of all sets of all functions

f: {0,1,2,------------2015}→{0,1,2,------------2015} such that f(f(i)) = i for all
0≤i≤2014. Consider the following statements
a. For each such function it must be the case that for every i, f(i) = i
b. For each such function , it must be the that for some I, f(i) = i
c. Each such function must be onto.
Which one of the following is correct

1. a,b & c are true.
2. Only b & c are true
3. Only a & b are true
4. Only c is true.

Q. 83 Find the domain of function f defined by f (x) = -1 / (x + 3) is

1. $(-\infty, -3) \cup (-3, \infty)$
2. $(-\infty, -3] \cup [3, \infty)$
3. $(-\infty, 3] \cup (3, \infty)$
4. None of these