ABHINAV ACADEMY

UDUPI

CET25M1 RELATIONS AND FUNCTIONS

Class 12 - Mathematics

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 75**

1. Given an arbitrary equivalence relation R in an arbitrary set X, R divides X into **[1]**

   a) intersecting sets
   b) two sets
   c) mutually disjoint subsets
   d) three sets

2. Let A = {1, 2, 3} and R = {(1, 2), (2, 3), (1, 3)} be a relation on A. Then, R is **[1]**

   a) symmetric
   b) None of these.
   c) transitive
   d) reflexive

3. Which of the following is not an equivalence relation on Z? **[1]**

   a) a R b $\Leftrightarrow$ a - b is an even integer
   b) a R b $\Leftrightarrow$ a + b is an even integer
   c) a R b $\Leftrightarrow$ a < b
   d) a R b $\Leftrightarrow$ a = b

4. Let T be the set of all triangles in the Euclidean plane, and let a relation R on T be defined as aRb if a is congruent to b $\forall$ a, b $\in$ T. Then R is **[1]**

   a) reflexive but not transitive
   b) equivalence
   c) reflexive but not symmetric
   d) transitive but not symmetric

5. Equivalence classes A_i satisfy **[1]**

   A. No element of A_i is related to any element of A_j, $i \neq j$
   B. No element of A_i is related to any element of A_i
   C. Some elements of A_i are related to any element of $A_{j,}$, $i \neq j$
   D. All elements of A_i are related to any element of A_j, $i \neq j_i$ are related to any element of $A_{j,}$ $i \neq j$

   a) B
   b) C
   c) A
   d) D

6. The relation R in the set {1, 2, 3} given by R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3)} is **[1]**

   a) an equivalence relation
   b) reflexive but neither symmetric nor transitive
   c) symmetric but neither reflexive nor transitive
   d) reflexive, symmetric but not transitive

7. Let X = {x^2 : x $\in$ N} and the relation f : N $\to$ X is defined by f(x) = x^2, x $\in$ N. Then, this function is **[1]**

   a) not bijective
   b) injective only
   c) surjective only
   d) bijective

8. The function f : $[\frac{-1}{2}, \frac{1}{2}] \to [\frac{-\pi}{2}, \frac{\pi}{2}]$ defined by f (x) = $\sin^{-1}(3x - 4x^3)$ is **[1]**

a) surjection but not an injection
b) neither an injection nor a surjection
c) injection but not a surjection
d) bijection

9. The relation R in N $\times$ N such that (a, b) R (c, d) $\Leftrightarrow$ a + d = b + c is **[1]**

a) reflexive and transitive but not symmetric
b) an equivalence relation
c) reflexive but symmetric
d) transitive but not symmetric

10. A function f : R $\to$ R defined by f(x) = 2 + x^2 is **[1]**

a) neither one-one nor onto
b) one-one
c) not onto
d) not one-one

11. Let f: (-1, 1) $\to$ B where f(x) = $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ is one-one and onto, then B equals **[1]**

a) $\left(0, \frac{\pi}{2}\right)$
b) $\left[0, \frac{\pi}{2}\right]$
c) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
d) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

12. Let f : R $\to$ R be given by f (x) = $[x]^2$ + [x + 1] - 3, where [x] denotes the greatest integer less than or equal to x. Then, f (x) is **[1]**

a) many-one and into
b) one-one and onto
c) many-one and onto
d) one-one and into

13. If A = {a, b, c}, then the relation R = {(b, c)} on A is **[1]**

a) reflexive and transitive only
b) reflexive only
c) symmetric only
d) transitive only

14. Let f : R $\to$ R be defined by f(x) = $2x^3 + 2x^2 + 300x + 5 \sin x$ then f is **[1]**

a) one-one onto
b) one-one into
c) many one onto
d) many one into

15. Let f : $N \to N : f(n) = \begin{cases} \frac{1}{2}(n+1), \text{ when } n \text{ is odd} \\ \frac{n}{2}, \text{ when } n \text{ is even.} \end{cases}$ **[1]**

then, f is

a) many-one and onto
b) one-one and into
c) many-one and into
d) one-one and onto

16. The void relation (a subset of A $\times$ A) on a nonempty set A is: **[1]**

a) Reflexive
b) Transitive and symmetric
c) Only symmetric
d) Only transitive

17. The function f : R $\to$ R defined by f(x) = x^2 + x is **[1]**

a) bijective
b) many-one
c) onto
d) one-one

18. The function f(x) = 10^x from R to $[0, \infty)$ is **[1]**

a) one-one and onto

b) an identity function

c) one-one and into

d) a constant function

19. Let the function f : N $\rightarrow$ N be defined by f(x) = x - 1, x > 2 and f(1) = f(2) = 1. The correct alternative will be **[1]**

a) f is one-one but not onto

b) f is many one onto

c) f is many one but not onto

d) f is one-one onto

20. f : R $\rightarrow$ R: f(x) = x^3 is **[1]**

a) many one and into

b) one one and onto

c) many one and onto

d) one one and into

21. Let set X = {1, 2, 3} and a relation Ris defined in X as: R = {(1, 3), (2, 2), (3, 2)}, then minimum ordered pairs which should be added in relation R to make it reflexive and symmetric are **[1]**

a) {(1, 1), (3, 3), (3, 1), (1, 2)}

b) {(1, 1), (2, 3), (1, 2)}

c) {(3, 3), (3, 1), (1, 2)}

d) {(1, 1), (3, 3), (3, 1), (2, 3)}

22. The relation R in the set of natural numbers N defined as R = {(x, y) : x > y} is **[1]**

a) reflexive, transitive but not symmetric

b) transitive but neither reflexive nor symmetric

c) reflexive, symmetric but not transitive

d) an equivalence relation

23. Let f : $R - \left[0, \frac{\pi}{2}\right)$ defined by f(x) = $\tan^{-1}(x^2 + x + 2a)$ then the set of values of **a** for which f is onto, is **[1]**

a) $\left[-\frac{1}{8}, \infty\right)$

b) $[-1, \infty)$

c) $\left(-\frac{1}{4}, \infty\right)$

d) $\left[\frac{1}{8}, \infty\right)$

24. The function f : A $\rightarrow$ B defined by f(x) = $-x^2 + 6x - 8$ is a bijection, if **[1]**

a) $A = (-\infty, 3]$ and $B = (-\infty, 1]$

b) $A = [-3, \infty)$ and $B = (-\infty, 1]$

c) $A = (-\infty, 3]$ and $B = [1, \infty)$

d) $A = [3, \infty)$ and $B = [1, \infty)$

25. S is a relation over the set R of all real numbers and its is given by (a, b) $\in$ S $\Leftrightarrow$ ab $\geq$ 0. Then, S is **[1]**

a) an equivalence relation

b) reflexive and symmetric only

c) symmetric and transitive only

d) antisymmetric relation

26. A function f from the natural numbers to the set of integers defined by f(n) = $\begin{cases} \frac{n-1}{2}, & when\ n\ is\ odd \\ -\frac{n}{2}, & when\ n\ is\ even \end{cases}$ is **[1]**

a) neither one-one nor onto

b) onto but not one-one

c) both one-one and onto

d) one-one but not onto

27. Let R = { (x,y): $x^2 + y^2 = 1$ and x, y $\in$ R } be a relation in R. The relation R is **[1]**

a) symmetric

b) anti – symmetric

c) reflexive

d) transitive

28. Let f : R $\rightarrow$ R be a function defined by $f(x) = \frac{x^2-8}{x^2+2}$. Then, f is **[1]**

a) one-one and onto

b) one-one but not onto

c) onto but not one-one | d) neither one-one nor onto

29. Let A = {a, b, c} and the relation R be defined on A as R = {(a, a), (b, c), (a, b)}. Then, find minimum number of ordered pairs to be added in R to make R reflexive and transitive. **[1]**

a) 3 | b) 1
c) 2 | d) 4

30. Let R be any relation in the set A of human beings in a town at a particular time. If R = { [x, y) : x is exactly 7 cm taller than y], then R is **[1]**

a) not symmetric | b) an equivalence relation
c) symmetric but not transitive | d) reflexive

31. Number of onto (subjective) functions from A to B if n(A) = 6 and n(B) = 3 are **[1]**

a) 340 | b) None of these
c) 2^6 - 2 | d) 3^6 - 3

32. Let R is reflexive relation on a finite set A having n element, and let there be m ordered pairs in R. Then **[1]**

a) m = n | b) m $\geq$ n
c) m $\neq$ n | d) m $\geq$ n

33. Let S be the set of all real numbers and let R be a relation on S defined by a R b $\Leftrightarrow$ a^2 + b^2 = 1. Then, R is **[1]**

a) Symmetric but neither reflexive nor transitive | b) Transitive but neither reflexive nor symmetric
c) Reflexive but neither symmetric nor transitive | d) Transitive but neither reflexive nor symmetric

34. Let $f : R \rightarrow R$ be defined as f (x) = 3x. Choose the correct answer. **[1]**

a) many – one onto | b) neither one – one nor onto
c) one – one but not onto | d) one – one onto

35. If A = {7, 8, 9}, then the relation R = {(8, 9)} in A is **[1]**

a) Equivalence | b) Reflexive only
c) Symmetric only | d) Non-symmetric

36. Let S be the set of all straight lines in a plane. Let R be a relation on S defined by $LRM \Leftrightarrow L \perp M$ Then R is **[1]**

a) transitive but neither reflexive nor symmetric | b) an equivalence relation
c) reflexive but neither symmetric nor transitive | d) symmetric but neither reflexive nor transitive

37. Let f : Z $\rightarrow$ Z be given by $f(x) = \begin{cases} \frac{x}{2}, \text{ if } x \text{ is even} \\ 0, \text{ if } x \text{ is odd} \end{cases}$. Then f is **[1]**

a) onto but not one-one | b) neither one-one nor onto
c) one-one but not onto | d) one-one and onto

38. The relation **congruence modulo m** on the set Z of all integers is a relation of type **[1]**

a) Transitive only
b) Symmetric only
c) Reflexive only
d) Equivalence

39. The relation S defined on the set R of all real number by the rule a S b if a $\geq$ b is **[1]**

a) neither transitive nor reflexive but symmetric
b) symmetric, transitive but not reflexive
c) an equivalence relation
d) reflexive, transitive but not symmetric

40. Let A = {1, 2, 3} and B = {4, 5, 6, 7} and let f = {(1, 4), (2, 5), (3, 6)} be a function from A to B. Then, f is **[1]**

a) many-one
b) bijective
c) one-one
d) onto

41. The greatest integer function f : R $\rightarrow$ R, given by f(x) = [x] is **[1]**

a) one-one
b) neither one-one nor onto
c) both one-one and onto
d) onto

42. A mapping f : n $\rightarrow$ N, where N is the set of natural numbers is defined as f(n) = $\begin{cases} n^2, & \text{for } n \text{ odd} \\ 2n+1, & \text{for } n \text{ even} \end{cases}$ for n $\in$ N. Then, f is **[1]**

a) bijective
b) neither injective nor surjective
c) injective but not surjective
d) surjective but not injective

43. Let A = {1, 2, 3}. Then number of relations containing (1, 2) and (1, 3) which are reflexive and symmetric but not transitive is **[1]**

a) 4
b) 2
c) 1
d) 3

44. The function f : X $\rightarrow$ Y defined by f(x) = sin x is one-one but not onto, if X and Y respectively equal to **[1]**

a) [0, π] and [0, 1]
b) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ and [-1, 1]
c) $\left[0, \frac{\pi}{2}\right]$ and [-1, 1]
d) R and R

45. R is a relation on the set Z of integers and it is given by (x, y) $\in$ R $\Leftrightarrow$ |x – y| $\leq$ 1. Then, R is **[1]**

a) an equivalence relation
b) symmetric and transitive
c) reflexive and symmetric
d) reflective and transitive

46. The maximum number of equivalence relations on the set A = {1, 2, 3} are **[1]**

a) 5
b) 1
c) 3
d) 2

47. The function f : R $\rightarrow$ R defined as f(x) = x^2 is **[1]**

a) many-one
b) neither one-one nor onto
c) onto
d) one-one

48. Let Z be the set of all integers and let R be a relation on Z defined by a R b $\Leftrightarrow$ (a - b) is divisible by 3 Then R is **[1]**

a) an equivalence relation
b) reflexive and transitive but not symmetric

c) symmetric and transitive but not reflexive

d) reflexive and symmetric but not transitive

49. Let A = {1, 2, 3, 4, 5, 6}. Which of the following partitions of A correspond to an equivalence relation on A? **[1]**

a) {1, 2}, {3, 5, 6}.

b) {1, 2, 3}, {3, 4, 5, 6}.

c) {1, 2, }, {3, 4}, {2, 3, 5, 6}

d) {1, 3}, {2, 4, 5}, {6}

50. A function f: X $\rightarrow$ Y is said to be one – one and onto if **[1]**

a) f is one – one

b) f is onto

c) f is both one – one and onto

d) f is either one – one or onto

51. Let R be the relation in the set {1, 2, 3, 4} given by R = {(1, 2), (2, 2), (1, 1), (4, 4), (1, 3), (3, 3), (3, 2)}. Then R is **[1]**

a) An equivalence relation.

b) Symmetric and transitive but not reflexive.

c) Reflexive and symmetric but not transitive

d) Reflexive and transitive but not symmetric

52. The relation R defined in the set A = {1, 2, 3, 4, 5, 6} as R = {(x, y) : y is divisible by x} is **[1]**

a) Reflexive, transitive but not symmetric

b) an equivalence relation

c) Reflexive, symmetric but not transitive

d) not symmetric

53. The relation R = {1, 1), (2, 2), (3, 3)} on the set {1, 2, 3) is **[1]**

a) an equivalence relation

b) reflexive relation only

c) symmetric relation only

d) transitive relation only

54. Let A = {1, 3, 5}. Then the number of equivalence relations in A containing (1, 3) is: **[1]**

a) 3

b) 2

c) 4

d) 1

55. Let A = {1, 2, 3} and consider the relation R = {1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1,3)}. Then R is **[1]**

a) neither symmetric, nor transitive

b) symmetric and transitive

c) reflexive but not symmetric

d) reflexive but not transitive

56. Let the function f : R $\rightarrow$ R be defined by f(x) = 2x + sin x for x $\in$ R. Then f is **[1]**

a) onto but not one-one

b) neither one-one nor onto

c) one-one but not onto

d) one-one and onto

57. Let R be the relation over the set of all straight lines in a plane such that l_1 R $l_2 \Leftrightarrow l_1 \perp l_2$. Then, R is **[1]**

a) symmetric and transitive but not Reflexive

b) Reflexive and transitive but not symmetric

c) Symmetric and reflexive but not transitive

d) Symmetric but neither reflexive nor transitive.

58. A relation R on a non – empty set A is an equivalence relation if it is **[1]**

a) reflexive, symmetric and transitive

b) reflexive

c) reflexive, antisymmetric, transitive

d) symmetric and transitive

59. If R is an equivalence relation on A, then R^{-1} on A is **[1]**

a) Reflexive only

b) Transitive only

c) Symmetric only

d) Equivalence relation

60. Let f : R $\rightarrow \left[0, \frac{\pi}{2}\right)$ defined by f(x) = $\tan^{-1}(x^2 + x + a)$, then the set of values of a for which f is onto is **[1]**

a) [1, 1]

b) [2, 1]

c) $\left[\frac{1}{4}, \infty\right)$

d) $[0, \infty)$

61. R = {(1, 1), (2, 2), (1, 2), (2, 1), (2, 3)} be a relation on A, then R is **[1]**

a) not anti symmetric

b) symmetric

c) anti symmetric

d) Reflexive

62. Let A and B be two non-empty sets and let f : (A x B) $\rightarrow$ (B x A) : f(a, b) = (b, a). Then, f is **[1]**

a) one-one and into

b) one-one and onto

c) many-one and onto

d) many-one and into

63. Let T be the set of all triangles in a plane with R be the relation in T given by R = {(T_1, T_2) : T_1 is congruent to T_2}. Then, R is **[1]**

a) not transitive

b) symmetric only

c) reflexive only

d) an equivalence relation

64. The relation **greater than** denoted by > in the set of integers is **[1]**

a) Asymmetric

b) Reflexive

c) Transitive

d) Symmetric

65. If A = {1, 2, 3}, then a relation R = {(2, 3)} on A is **[1]**

a) Asymmetric only

b) symmetric only

c) symmetric and transitive only

d) transitive only

66. The relation R is the set of natural number N defined as R = {(x, y) : x + 4y = 10, x, y $\in$ N} is **[1]**

a) transitive but neither reflexive nor symmetric

b) Reflexive, symmetric but nor transitive

c) an equivalence relation

d) Reflexive but neither symmetric nor transitive

67. Let f : R $\rightarrow$ R defined by f(x) = $\frac{e^{x^2}-e^{-x^2}}{e^{x^2}+e^{-x^2}}$ then **[1]**

a) f(x) is one-one and onto

b) f(x) is one-one but not onto

c) f(x) is neither one-one nor onto

d) f(x) is many one but onto

68. Let A be the set of all points in a plane and let O be the origin. Let R = {(P, Q) : OP = OQ}. Then, R is **[1]**

a) An equivalence relation

b) Symmetric and transitive but not reflexive

c) Reflexive and symmetric but not transitive

d) Reflexive and transitive but not symmetric

69. Let $f : R \rightarrow R$ be defined by f (x) = $\frac{1}{x}$, $\forall x \in R$. Then f is **[1]**

a) one – one

b) Bijective

c) f is not defined

d) Onto

70. If R is a relation on the set A = {1, 2, 3} given by R = (1, 1), (2, 2), (3, 3), then R is **[1]**

a) transitive
b) reflexive
c) symmetric
d) all the three options

71. Let N be the set of natural numbers and the function $f : N \to N$ be defined by $f(n) = 2n + 3 \ \forall \ n \in N$. Then f is **[1]**

a) surjective and bijective
b) bijective
c) surjective
d) injective

72. Equivalence classes are **[1]**

a) trivial sets
b) mutually disjoint subsets
c) intersecting sets
d) power sets

73. Let L denote the set of all straight lines in a plane. Let a relation R be defined by lRm if and only if l is perpendicular to m $\forall$ l, m $\in$ L. Then R is **[1]**

a) transitive
b) Asymmetric
c) reflexive
d) symmetric

74. A relation R on the set N of natural numbers is defined as R = {(a, b): a + b is even, $\forall$ a, b $\in$ N}, then R is **[1]**

a) a reflexive relation but not symmetric
b) an equivalence relation
c) symmetric but not transitive
d) not an equivalence relation

75. $f : C \to R : f(z) = |z|$ is **[1]**

a) many-one and onto
b) one-one and into
c) one-one and onto
d) many-one and into