UNIVERSITY OF CALICUT

SCHOOL OF DISTANCE EDUCATION

B Sc (MATHEMATICS)

(2011 Admission Onwards)

I Semester

Core Course

FOUNDATIONS OF MATHEMATICS (MODULE I & II)

QUESTION BANK

1) If A and B are two sets such that $A \subseteq B$, then $A \cup B$ is

a) A b) B c) $\emptyset$ d) $A \cap B$

2) If A and B are two disjoint sets, then $A \oplus B =$ ……..

a) A b) $A \cap B$ c) $A \cup B$ d) B

3) If A= {a, e, i, o, u} and B {a, b, c, d, e}, then A – B = ………

a) { i, o, u} b) { b, c, d,} c) $\emptyset$ d) {a, b, d,}

4) For any two sets A and B, A – B = ……….

a) B – A b) $A \cap \overline{B}$ c) $\overline{A} \cap B$ d) $\overline{A} \cap \overline{B}$

5) If $A_i = \{1, 2, 3, \ldots, i\}$ for I = 1, 2, 3, ……, then $\bigcap_{i=1}^{\infty} A_i =$ ………

a) {1} b) {1, 2, 3, …….} c) {1, 2, 3, ….., i} d) $\emptyset$

6) If A = {1, 3, 5} and B {1, 2, 3}, then $A \oplus B =$ ……….

a) {5} b) {2} c) {2, 5} d) {1, 2, 3, 5}

7) Who is considered to be the father of set theory?

a) Bertand Russel b) George Cantor

c) Srinivasa Ramanujan d) George Boole

8) Which of the following is an identity?

a) $\overline{A-B} = B - A$ b) $\overline{A-B} = \overline{A} \cap B$

c) $\overline{A-B} = A \cup B$ d) $\overline{A-B} = A \cap \overline{B}$

9) A and B are subsets of a universal set having 12 elements. If A has 7 elements, B has 9 elements and $A \cap B$ has 9 elements , then what is the number of elements in $A \cup B$?

a) 11 b) 16 c) 22 d) 10

10) Two sets A and B are called disjoint if $A \cap B =$ …….

a) A b) B c) $\emptyset$ d) $A \cap B$

11) For any two sets A and B, A – B defined by

a) $\{x : x \in A \text{ and } x \in B\}$ b) $\{x : x \in A \text{ and } x \notin B\}$
c) $\{x : x \notin A \text{ and } x \in B\}$ d) $\{x : x \in A \text{ or } x \in B\}$

12) The cardinality of $\{\emptyset\}$ is

a) 0 b) 2) c) 1 d) not defined

13) The number of subsets of the set A = {x : xis a day of the week} is

a) 7 b) 2^6 c) 2^7 d) 14

14) If $|A| = 24$, $|B| = 69$ and $|A \cup B| = 81$, then $|A \cap B| =$ ……….

a) 12 b) 10 c) 14 d) 15

15) For any two sets A and B, $(A \cup B) \cap \left(A \cup \overline{B}\right) =$ ……..

a) B b) $\overline{A}$ c) A d) $\overline{B}$

16) For any two sets A and B, $\overline{A \cup B}$ = ……………

a) $\overline{A} \cup \overline{B}$ b) $\overline{A} \cap \overline{B}$ c) $A \cap \overline{B}$ d) $\overline{A} \cap B$

17) For any two sets A and B, $\overline{A \cap B}$ = ……….

a) $\overline{A} \cap \overline{B}$ b) $\overline{A} \cap B$ c) $\overline{A} \cup \overline{B}$ d) $\overline{A} \cup B$

18) If a set A has n elements, then the number of its subsets is

a) 2^n b) 2^{n+1} c) 2n d) n^2

19) If A = {1, 2, 3, 4}, then the number of non-empty subsets of A is

a) 16 b) 15 c) 32 d) 3

20) A – B = A if and only if

a) $A \subseteq B$ b) $B \subseteq A$ c) $A = B$ d) $A \cap B = \emptyset$

21) A – B = ∅ if and only if

a) $A \subseteq B$ b) $B \subseteq A$ c) $A \cap B = \emptyset$ d) None of these

22) A – B = B – A if and only if

a) $A \subseteq B$ b) $B \subseteq A$ c) $A = B$ d) $A \cap B = \emptyset$

23) Which of the following is not true?

a) $A \cap B \subseteq A$ b) $A \subseteq A \cup B$ c) $A - B \subseteq A$ d) $A \subseteq A - B$

24) A – (B∪C)= ……

a) $(A - B) \cup (A - C)$ b) $(A \cup B) - (A \cup C)$

c) $(A - B) - (A - C)$ d) $(A - B) \cap (A - C)$

25) For any three sets A, B, C, (A∪ (B∩ C) = ……..

a) $(A \cup B) \cap (A \cup C)$ b) $(A \cup B) \cup (A \cup C)$

c) $(A \cap B) \cap (A \cap C)$ d) None of these

26) If a and B are any two sets, then (A∪B) – (A∩B) = ………

a) $A - B$ b) $B - A$ c) $(A-B) \cup (B-A)$ d) ∅

27) $A\cap(A\cup B) =$ ....

a) A b) B c) $A\cup B$ d) $A\cap B$

28) The set of all Prime number is

a) A finite set b) A singleton set

c) An infinite set d) None of these

29) If $A\cap B = A$ and $A\cup B = A$, then

a) $A\subseteq B$ b) $B\subseteq A$ c) $A = B$ d) None of these

30) If a and B are any two sets, then $A\cap(\overline{A\cup B}) =$ ....

a) B b) $\overline{B}$ c) A d) $\emptyset$

31) For any two sets A and B, $A - (A - B) =$ ....

a) $B - A$ b) $A\cap B$ c) $\emptyset$ d) None of these

32) If A and B are any two sets, then $A\cup B$ is not equal to

a) $(A - B)\cup(B - A)\cup(A\cap B)$ b) $\left(\overline{\overline{A}\cap\overline{B}}\right)$

c) $(A - B)\cup(B - A)$ d) $A\cup(B - A)$

33) A, B, C are three sets such that $A\cup B = A\cup C$ and $A\cap B = A\cap C$ then

a) $A = B$ b) $B = C$ c) $A = C$ d) $A = B = C$

34) If Q is the set of rational numbers and P is the set of irrational numbers, then

a) $P\cap Q = \emptyset$ b) $P\subseteq Q$ c) $Q\subseteq P$ d) $P - Q = \emptyset$

35) If A and B are two finite sets, then $n(A)+n(B)$ is equal to

a) $n(A\cup B)$ b) $n(A\cap B)$

c) $n(A\cup B) + n(A\cap B)$ d) $n(A\cup B) - n(A\cap B)$

36) If A and B are finite sets and $A\subseteq B$, then $n(A\cup B) =$ ....

a) $n(A)$ b) $n(B)$ c) 0 d) None of these

37) If a set A contains 4 elements and a set B contains 8 elements, then the maximum number of elements in A∪B is

a) 4 b) 12 c) 8 d) None of these

38) If a set A has 3 elements and B has 6 elements, then the minimum number of elements in A∪B is

a) 6 b) 3 c) 9 d) None of these

39) For any two sets A and B, A x B = B x A if and only if

a) A is a proper subset of B b) B is a proper subset of A
c) A = B d) None of these

40) If $\mathbb{N}_a = \{an : n \in \mathbb{N}\}$, where $\mathbb{N} = \{1, 2, 3, ...\}$, then $\mathbb{N}_6 \cap \mathbb{N}_8 =$ ....

a) $\mathbb{N}_2$ b) $\mathbb{N}_{48}$ c) $\mathbb{N}_8$ d) $\mathbb{N}_{24}$

41) For any three sets A, B, C, A x (B – C) = ...

a) (A x B) ∪ (A x C) b) (A x B) ∩(A x C)
c) (A x B) – (A x C) d) (A x C) – (A x B)

42) If (x + 1, y – 3) = (3, 5), then x + 2y = ...

a) 2 b) 16 c) 18 d) 20

43) If (a + b, a – b) = (2, 4), then (a, b) = ...

a) (3, -1) b) (3, 1) c) (-3, 1) d) (-3, -1)

44) If n(A) = 3 and n(B) = 7, then n(A x B) = ...

a) 10 b) 3^7 c) 7^3 d) 21

45) For any two sets A and B, a relation from A to B is a subset of ....

a) A b) B c) A x B d) B x A

46) For any set A, the relation on A defined by {(a, a): a ∈ A} is called the ....

a) Universal relation b) Empty relation
c) Equality relation d) None of these

47) If A = {1, 2} and B = {3, 4, 5}, then the number of relation from A to B is

a) 2^5 b) 2^6 c) 2^2 d) 2^3

48) If n(A) = 3 and n(B) = 5, then n (A x B x A) = …….

a) 45 b) 15 c) 18 d) 11

49) If A is any set and B is the empty set, then A x B = ………

a) A b) B c) ∅ d) None of these

50 If (2x, x + y) = (8, 6) then y = ……….

a) 4 b) 2 c) -2 d) 5

51 A relation R from A to B is given by R = {(1, a), (1, b), (3, a), (3, b), (5, c)}. What is the minimum possible number of ordered pairs in A x B ?

a) 6 b) 3 c) 12 d) 9

52) If R is a relation from a non-empty set A to a non-empty set B, then

a) R = A∩B b) R = A∪B c) R = A x B d) R ⊆ A x B

53) Let R be the relation on ℕ = {1, 2, 3, ……} defined by xRy is and only if x + 2y = 8. The domain of R is

a) {2, 4, 6} b) {2, 4, 6, 8} c) {2, 4, 6, 8, 10} d) {2, 4, 8}

54) Let A = {a, b, c} then the range of the relation R = {(a, b), (a, c), (b, c)} defined on A is

a) {a, b} b) {c} c) {a, b, c} d) {b, c}

55) Let A = {1, 2, 3}. Then the domain of the relation R = {(1, 1), (2, 3), (2, 1)} defined on A is

a) {1, 2,} b) {1, 3} c) {1, 2, 3} d) {1}

56) If A is a finite set containing 'n' distinct elements, then the number of relations on A is

a) 2^n b) n^2 c) 2^{n^2} d) 2n

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

a) Reflexive b) Symmetric

c) Anti symmetric d) None of these

58) Let A = {1, 2, 3}, then the relation R = {(1, 1), (2, 2), (1, 3)} on A is

a) Reflexive b) Transitive c) Symmetric d) None of these

59) A relation R on a non-empty set A is an equivalence relation if and only if it is

a) Reflexive
b) Symmetric and transitive
c) Reflexive, symmetric and transitive
d) None of these

60) Let A = {1, 2, 3, 4, 5, 6}, which of the following partitions of A correspond to an equivalence relation on A?

a) $[\{1,2,3\},\{3,4,5,6\}]$
b) $[\{1,2\},\{4,5,6\}]$
c) $[\{1,2\},\{3,4\},\{2,3,5,6\}]$
d) $[\{1,3\},\{2,4,5\},\{6\}]$

61) Let A = {1, 2, 3}, which of the following is not an equivalence relation on A?

a) $\{(1,1),(2,2),(3,3)\}$
b) $\{(1,1),(2,2),(3,3),(1,2),(2,1)\}$
c) $\{(1,1),(2,2),(3,3),(2,3),(3,2)\}$
d) $\{(1,2),(2,3)\}$

62) Which of the following is not an equivalence relation on the set of integer?

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

63) Let L be the set of all straight lines in the Euclidean plane. Two lines L_1 and L_2 are related by the relation R if and only if 'L_1 is perpendicular to L_2. Then R is

a) Reflexive
b) Symmetric
c) Transitive
d) None of these

64) If f(x) = ax + b and g (x) = cx + d, then (fog) (x) – (gof) (x) = ……..

a) f(a) – g(c)
b) f(c) + g(a)
c) f(d) – g(b)
d) f(d) + g(b)

65) Let W denote the set of words in English dictionary. Define $\mathbb{R}$ on W by R = {(x, y) ∈ W x W: the words 'x' and 'y' have atleast one letter in common}. Then $\mathbb{R}$ is

a) Reflexive, not symmetric and transitive.

b) Not reflexive, symmetric and transitive.

c) Reflexive, symmetric and not transitive.

d) Reflexive, symmetric and transitive.

66) Let R = {(1, 3), (4, 2), (2, 4), (2, 3), (3, 1)} be a relation on A = {1, 2, 3, 4}, then R is

a) Not symmetric b) Transitive

c) A function d) Reflexive

67) Let f: ℝ→ℝ and g: ℝ→ℝ be defined by $f(x) = x^2$ and $g(x) = x+3$, then (gof)(2) =....

a) 7 b) 25 c) 12 d) 2

68) 25 (mod 7) = ……….

a) 14 b) 7 c) 4 d) 25

69) If $f(x) = \frac{1}{x-2}$, then its domain is

a) ℝ b) ℝ – {1} c) {2} d) ℝ – {2}

70) If A = {a, b} and B = {1, 2, 3}, then the number of functions from A to B is

a) 2^3 b) 3^2 c) 2 x 3 d) 2 + 3

71) Let f: A→B, then fof is defined when

a) A⊆B b) A∪B = ℝ c) A≠B d) A = B

72) Let f: ℝ→ℝ be defined by f(x) =2x-3. Then $f^{-1}(1)$ is

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

73) -26(mod 7) = ……..

a) 2 b) 7 c) 5 d) 5

74) Let f: ℝ→ℝ be defined by $f(x) = x^2 - 3x$ if $x \geq 2$

$= x + 2$ if $x < 2$

a) 25 b) 15 c) 10 d) -10

75) If $f(x) = 2x + 3$ and $g(x) = x^2 + 7$, then the values of 'x' for which g(f(x)) = 8 are

a) 1, 2 b) -1, 2 c) -1, -2 d) 1, -2

76) If A is the set of even natural numbers less than 8 and B is the set of Prime numbers less than 7, then the number of relations from A to B is

a) 2^9 b) 9^2 c) 3^2 d) $2^9 - 1$

77) Let A = {1, 2, 3} and B = {2, 3, 4}, then which of the following is a function from A to B?

a) {(1, 2), (1, 3), (2, 3), (3, 3)} b) {(1, 3), (2, 4)}

c) {(1, 3), (2, 3), (3, 3)} d) {(1, 2), (2, 3), (3, 4), (3, 2)}

78) The domain of the function f = {(1, 3), (3, 5), (2, 6)} is

a) {1, 2, 3} b) {1, 2} c) {3, 5, 6} d) {5, 6}

79) If f = {(1, 4), (2, 5), (3, 6)} and g = {(4, 8), (5, 7), (6, 9)}, then gof is

a) ∅ b) {(1, 8), (2, 7), (3, 9)}

c) {(1, 7), (2, 8), (3, 9)} d) None of these

80) Let A = {1, 2, 3, 4} which of the following functions is a bijection from A to A?

a) {(1, 2), (2, 3), (3, 4), (4, 1)} b) {(1, 2), (2, 2), (3, 2), (4, 2)}

c) {(1, 2), (2, 2), (3, 3), (4, 3)} d) {(1, 4), (2, 3), (3, 3), (4, 2)}

81) Let A = [-1, 1] and f: A→A be defined by f(x) = x|x|. Then f is

a) One-one but not onto b) Onto but not one-one

c) Both one-one and onto d) None of these

82) Let f: ℝ→ℝ be defined by $f(x) = x^2 - 3x + 4$. Then $f^{-1}(2)$ = ……

a) {1, 2} b) (1, 2) c) [1, 2] d) None of these

83) Let A be a set containing 'n' distinct elements. The number of functions that can be defined from A to A is

a) 2^n b) n^n c) n! d) n^2

84) On the set ℤ of all integers define f: ℤ→ℤ by

$$F(x) = \frac{x}{2} \quad \text{if x is even}$$
$$= 0 \quad \text{if x is odd}$$

Then f is

a) Onto but not one-one b) One-one and onto

c) One-one but not onto d) None of these

85) Let A be a set containing 'n' distinct elements. How many bijections from A to A can be defined?

a) n^2 b) n! c) n d) 2n

86) If $f(x) = x - x^2$, then $f(a + 1) - f(a - 1)$, $a \in \mathbb{R}$ is

a) 4 – 2a b) 2a + 4 c) 2a – 4 d) 2 – 4a

87) If $f(x) = \frac{1}{\sqrt{2x-4}}$, then its domain is

a) $\mathbb{R} - \{2\}$ b) $\mathbb{R}$ c) $(2, \infty)$ d) $[2, \infty]$

88) Range of the function $f(x) = \frac{1}{3x+2}$ is

a) $\mathbb{R}$ b) $\mathbb{R} - \{0\}$ c) $(0, \infty)$ d) None of these

89) The domain of the function $f(x) = \frac{1}{\sqrt{4-x^2}}$ is

a) {-2, 2} b) [-2, 2] c) (-2, 2) d) $(-\infty, 2) \cup (2, \infty)$

90) Which of the following is a Polynomial function?

a) $\frac{x^2-1}{x}$, $x \neq 0$ b) $x^3 + 3x^2 - 4x + \sqrt{2}\, x^{-2}$, $x \neq 0$

c) $\frac{3x^3+7x-1}{3}$ d) $2x^2 + \sqrt{x} + 1$

91) Let $f: \mathbb{R} \to \mathbb{R}$ be defined by

$$f(x) = 1 \quad \text{if } x \in Q$$
$$= -1 \quad \text{if } x \in \mathbb{R} - Q, \text{ where Q is the set of rational numbers.}$$

Then $f(\pi) - f\left(\frac{22}{7}\right)$ is equal to

a) 0 b) 2 c) -2 d) 1

92) If for a function f(x), f(x + y) = f(x) + f(y) for all real number 'x' and 'y, then f(0)=……..

a) 1 b) -1 c) 2 d) 0

93) If $f(x) = x^2 + 1$, then $(fof)(x) =$ ....

a) $x^4 + 1$ b) x^4+2x^2+2

c) x^4+x^2+1 d) $x^4 - 1$

94) If $f(x) = ax + b$ and $g(x) = cx + d$, then $f(g(x)) = g(f(x))$ if and only if

a) $f(a) = g(c)$ b) $f(b) = g(b)$

c) $f(d) = g(b)$ d) $f(c) = g(a)$

95) If a function F is such that $F(0) = 2$, $F(1) = 3$ and $F(n+2) = 2F(n) - F(n+1)$ for $n \geq 0$, then $F(5) =$ ....

a) -7 b) -3 c) 7 d) 13

96) The domain of the function $f(x) = \sqrt{x - |x|}$ is

a) $\{0\}$ b) $\mathbb{R}$ c) $(-\infty, 0]$ d) $[0,\infty)$

97) If $f(x) = \log\left(\frac{1+x}{1-x}\right)$ and $g(x) = \left(\frac{3x+x^3}{1+3x^2}\right)$ then $f(g(x)) =$ ....

a) $f(x)$ b) $-f(x)$ c) $3f(x)$ d) $(f(x))^3$

98) The range of the function $f(x) = |x - 1|$ is

a) $\mathbb{R}$ b) $(0, \infty)$ c) $[0, \infty)$ d) $(-\infty, 0)$

99) If $f(x) = x^2 - 3x + 1$ and $f(2\propto) = 2f(\propto)$, then $\propto =$ ....

a) 3 b) $\frac{1}{\sqrt{3}}$ c) $\frac{1}{\sqrt{2}}$ or $\frac{-1}{\sqrt{2}}$ d) None of these

100) If $f(x) = 1 - \frac{1}{x}$, then $f\left(\frac{1}{x}\right) =$ ....

a) x b) $\frac{1}{x} - 1$ c) $1 - x$ d) $-x$

101) If $f: \mathbb{R}\to\mathbb{R}$ is given by $f(x) = |x|$ and $A = \{ x \in \mathbb{R} : x>0\}$, then $f^{-1}(A) =$ ....

a) $\mathbb{R}$ b) $\mathbb{R} - \{0\}$ c) A d) $\emptyset$

102) If $f(x) = 2x - 3, x \leq 2$

$= x, \ x > 2$, then $f(1) =$ ....

a) $2f(2)$ b) $-f(2)$ c) $f(2)$ d) $\frac{1}{2}f(2)$

103) If f: A→ B, then f^{-1} exists only when

a) f is one-one b) f is onto

c) f is both one-one and onto d) none of these

104) Let A = {a, b, c} and f = {(a, c), (b, a), (c, b)} be a function from A to A, then f^{-1} is

a) {(c, a), (a, b), (b, c)} b) {(a, a), (b, b), (c, c)}

c) {(a, c), (b, a), (c, b)} d) None of these

105) Let f: $\mathbb{R}\to\mathbb{R}$ be given by $f(x) = 2x + 3$, then f^{-1} is

a) $\frac{x-3}{2}$ b) $\frac{x+3}{2}$ c) $2x + 3$ d) None of these

106 If $f(x) = \frac{2x+1}{3x-2}$, then (fof) (2) = ………………..

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

ANSWER KEY

FOUNDATIONS OF MATHEMATICS *(MODULE I & II)*

1)	b	2)	c	3)	a	4)	b	5)	a	6)	c	7)	b
8)	b	9)	d	10)	c	11)	b	12)	c	13)	c	14)	a
15)	c	16)	b	17)	c	18)	a	19)	b	20)	d	21)	a
22)	c	23)	d	24)	d	25)	a	26)	c	27)	a	28)	c
29)	c	30)	d	31)	b	32)	c	33)	b	34)	a	35)	c
36)	b	37)	b	38)	a	39)	c	40)	d	41)	c	42)	c
43)	a	44)	d	45)	c	46)	c	47)	b	48)	a	49)	c
50)	b	51)	d	52)	d	53)	a	54)	d	55)	a	56)	c
57)	d	58)	b	59)	c	60)	d	61)	d	62)	b	63)	b
64)	c	65)	c	66)	a	67)	a	68)	c	69)	d	70)	b
71)	d	72)	b	73)	a	74)	c	75)	c	76)	a	77)	c
78)	a	79)	b	80)	a	81)	c	82)	a	83)	b	84)	a
85)	b	86)	d	87)	c	88)	b	89)	c	90)	c	91)	c
92)	d	93)	b	94)	c	95)	d	96)	d	97)	c	98)	c
99)	c	100)	c	101)	b	102)	b	103)	c	104)	a	105)	a
106)	d												

FOUNDATIONS OF MATHEMATICS *(MODULE III & IV)*

1. Which of the following is a Proposition?
   a. What time is it? b. Read this carefully
   c. $x + 1 = 2$ d. $2 + 2 = 3$
2. Which of the following is not a Proposition?
   a. Toronto is the capital of India b. $1 + 1 = 2$
   c. $x + y = z$ d. You pass the course
3. Which of the following Proposition has truth value T
   a. $2 + 3 = 5$ b. $5 + 7 = 10$
   c. The moon is made of green cheese d. $5 \geq 20$
4. Which of the following is a false Proposition.
   a. $2 \geq 1$ b. $2^2 + 3^2 = 13$
   c. $\frac{1}{0} = \alpha$ d. $\pi \neq 3.14$
5. Let p, q be true Propositions, then which of the following Compound Proposition has truth value F
   a. $p \wedge q$ b. $p \vee q$
   c. $p \to q$ d. $p \oplus q$
6. $p \to q$ is false when
   a. p is true and q is true b. p is true and q is false
   c. p is false and q is true d. p is false and q is false
7. What is the converse of $p \to q$
   a. $p \to q$ b. $q \to p$
   c. $\neg p \to \neg q$ d. $\neg q \to \neg p$
8. What is the inverse of $p \to q$
   a. $p \to q$ b. $q \to p$
   c. $\neg p \to \neg q$ d. $\neg q \to \neg p$
9. What is the contra positive of $p \to q$
   a. $p \to q$ b. $q \to p$
   c. $\neg p \to \neg q$ d. $\neg q \to \neg p$
10. $p \wedge q$ is true when
    a. Both p and q are true b. p is true and q is false
    c. p is false and q is true d. both p and q are false

11. The length of the bit string 101010011 is

    a. 5 b. 4

    c. 9 d. 6

12. Determine which of these conditional statements is false.

    a. If 1 + 1 = 2 then 2 + 2 = 5 b. If 1 + 1 = 3 then 2 + 2 = 4

    c. If 1 + 1 = 3 then 2 + 2 = 5 d. If monkeys can fly, then 1 + 1 = 3

13. Which of the following is a tautology

    a. $p \vee q$ b. $p \vee \neg p$

    c. $p \to \neg p$ d. $\neg p \to p$

14. $\neg (p \wedge q)$ = ……………………..

    a. $\neg p \wedge \neg q$ b. $\neg p \to \neg p$

    c. $p \vee p$ d. $\neg p \vee \neg p$

15. Which of the following is not logically equivalent to $p \to q$

    a. $p \to q$ b. $\neg p \vee q$

    c. $\neg q \to \neg p$ d. $q \to p$

16. $p \wedge T$ = …………………

    a. $p \to q$ b. $\neg p \vee q$

    c. $\neg q \to \neg p$ d. $q \to p$

17. $p \vee T$ = …………………

    a. T b. F

    c. p d. $\neg p$

18. Let Q(x,y) denote the statement "x = y + z". Then Q(3,0) is

    a. 3 = 0 b. 0 = 3 + 3

    c. 3 = 0 + 3 d. 3 = 3 + 0

19. Let R(x,y,z) be "x+y=z". Then the truth values of R(1,2,3) and R(0,0,1) are respectively.

    a. T and T b. T and F

    c. F and T d. F and F

20. Let P(x) be "x>3". Then the truth values of p(4) and p(2) are respectively.

    a. T, F b. T, T

    c. F, T d. F, F

21. Which of the following statement is true if the domain consists of all real numbers.

    a. $\exists x(x^3 = -1)$ b. $\exists x (x^2 < 0)$

    c. $\forall x (x^2 = 0)$ d. $\forall x (x^2 \geq x)$

22. Let Q(x) be the statement “x + 1 > 2x”. If the domain consists of all integers, which of the following is false

    a. Q (0) b. ∃ x Q(x)

    c. ∀x Q(x) d. Q(-1)

23. ¬ ∀ x p(x) ≡ ……………

    a. ∀x p(x) b. ∀x ¬ p(x)

    c. ∃ x p(x) d. ∃ x ¬ p(x)

24. ¬ ∃ x p(x) ≡ ……………

    a. ∀x p(x) b. ∀x ¬ p(x)

    c. ∃ x p(x) d. ∃ x ¬ p(x)

25. The rule of inference called simplification is

    a. $\frac{p}{\text{y}\, p \;\Xi\; q}$ b. $\frac{q}{\therefore p \wedge q}$ p

    c. $\frac{p\ \text{Ɛ}\!\vee q \qquad \Xi\, p}{\therefore q}$ d. $\frac{p \wedge q}{\text{y}\, p}$

26. . $\frac{p \;\Xi\; q \qquad \text{Ɛ}\neg p \text{Ɛ}\!\vee r}{\therefore q \;\Xi\; r}$ is known as

    a. conjuction b. disjunction

    c. Modus tollens d. Resolution

27. $\frac{p \qquad p \to q}{\therefore q}$ is known as

    a. Modus tollens b. Hypothetical syllogism

    c. Modus Ponens d. Implication

28. Which of the following is not a rule of inference

    a. Modus Ponens b. Predicate

    c. Disjunctive Syllogism d. Addition

29. In Propositional logic, a sequence of Propositions is called

    a. Premise b. conclusion

    c. argument d. argument form

30. $\frac{?x\ p(x)}{\text{y}\ p(c)}$ Is known as

    a. Universal instantiation b. universal generalisation

    c. Existential instatiation d. Existential generalisation

31. Who wrote the book “The Laws of Thought”

    a. Aristotle b. Euclid

    c. George Boole d. Euler

32. Conjuction of p and q is denoted by

    a. $p \vee q$ b. $p \wedge q$
    c. $p \rightarrow q$ d. $p \leftrightarrow q$

33. The disjunction of p and q is denoted by

    a. $p \vee q$ b. $p \wedge q$
    c. $p \oplus q$ d. $p \rightarrow q$

34. "p only if q" is denoted by

    a. $p \rightarrow q$ b. $q \rightarrow p$
    c. $p \leftrightarrow q$ d. $p \oplus q$

35. Which of the following is not an expression for $p \rightarrow q$

    a. p is sufficient for q b. q unless $\neg$ p
    c. q whenever p d. p is necessary for q

36. Which of the following is not an expression for $p \rightarrow q$

    a. If p, q b. q when p
    c. p follows from q d. p implies q

37. Which of the is not an expression for $p \leftrightarrow q$

    a. If p then q, and conversely b. p iff q
    c. p is necessary and sufficient for q d. p whenever q

38. Which of the following logical operator takes precedence over the remaining

    a. $\neg$ b. $\wedge$
    c. $\vee$ d. $\rightarrow$

39. The bitwise AND of 01 and 11 is

    a. 01 b. 11
    c. 10 d. 00

40. The bitwise XOR of of the bitstrings 01 1011 0110 and 11 0001 1101 is

    a. 11 1011 1111 b. 01 0001 0100
    c. 10 1010 1011 d. 10 1000 1010

41. The Compound Propositions p and q are called logically equivalent if $p \leftrightarrow q$

    a. a tatutology b. a contradition
    c. a contingency d. none of these

42. $p \rightarrow q$ and ……………… are logically equivalent.

    a. $q \rightarrow p$ b. $\neg p \vee q$
    c. $\neg p \wedge q$ d. $\neg p \rightarrow \neg q$

43. $p \vee (q \wedge r)$ and ……………… are logically equivalent.
    a. $(p \vee r) \vee (q \vee r)$ b. $(p \vee q) \vee (p \vee r)$
    c. $(p \vee q) \vee (p \wedge r)$ d. $(p \vee q) \wedge (p \vee r)$
44. $\neg(\neg p) \equiv p$. This law is known as
    a. Absorption Law b. Negation Law
    c. Double Negation Law d. Identity Law
45. $p \vee q \equiv q \vee p$. This law is known as
    a. Associative Law b. Identity Law
    c. Absorption Law d. Commutative Law
46. $p \vee (p \wedge q) \equiv p$. This law is known as
    a. Associative Law b. Identity Law
    c. Absorption Law d. Idempotent Law
47. In the statement “x is greater than 3” the part “is greater than 3” is known as
    a. Subject b. Proposition
    c. Predicate d. Logical Operator
48. The statement “p(x) for all values of x in the domain” is
    a. $\forall x\, p(x)$ b. $\exists x\, p(x)$
    c. $\forall x\, \neg p(x)$ d. $\exists x\, \neg p(x)$
49. An element for which p(x) is false is called a ----------------------- of $\forall x\, p(x)$
    a. Predicate b. Counter example
    c. domain d. Universe of discourse
50. $\forall x\, p(x)$ is true when
    a. There is an x for which p(x) is true b. p(x) is false for all x
    c. there is an x for which p(x) is false d. p(x) is true for every x
51. Let Q(x) be the statement “$x < 2$” which of the following is a counter example for $\forall x\, Q(x)$, where the domain is R.
    a. 2 b. 0
    c. -1 d. 1.5
52. Let p(x) be the statement “$x^2 \geq x$” which of the following is not a counter example for $\forall x\, p(x)$ where the domain is R.
    a. $\frac{1}{2}$ b. 2
    c. $\frac{3}{7}$ d. 0.17

53. $\exists x\ p(x)$ is false when

a. P(x) is false for every x b. p(x) is true for every x

c. there is an x for which p(x) is false d. there is an x for which p(x) is true

54. What is the negation of the statement $\forall x(x^2 > x)$

a. $\forall x\ (x^2 < x)$ b. $\forall x\ (x^2 \leq x)$

c. $\exists x\ (x^2 > x)$ d. $\exists x\ (x^2 \leq x)$

55. What is the negation of the statement $\exists x(x^2 = x)$

a. $\exists x\ (x^2 \neq 2)$ b. $\forall x\ (x^2 \neq 2)$

c. $\exists x\ (x^2 > 2)$ d. $\forall x\ (x^2 = 2)$

56. Let p(x) be the statement "$x = x^2$". If the domain consists of the integers, which of the following is true

a. P (-1) b. $\forall x\ p(x)$

c. $\exists x\ p(x)$ d. p(2)

57. Let Q(x) be "$x + 1 > 2x$". If the domain consists of the integers, which of the following is false.

a. Q (0) b. $\forall x\ Q(x)$

c. $\exists x\ Q(x)$ d. Q(-1)

58. Which of the following is true, if the domain consists of all integer

a. $\forall n\ (n = -n)$ b. $\exists n\ (n^2 < 0)$

c. $\forall n\ (n2 > 0)$ d. $\forall n\ (n + 1 > n)$

59. Which of the following is false, if the domain consists of all real number.

a. $\exists x\ (x^3 = -1)$ b. $\exists x\ (x^4 < x^2)$

c. $\forall x\ ((-x)^2 = x^2)$ d. $\forall x\ (2x < x)$

60. Let p(x) be the statement "the word x contains the letter a" which of the following is false.

a. P (orange) b. p (true)

c. p (false) d. p (elephant)

61. The tautology $(p \wedge (p \rightarrow q)) \rightarrow q$ is the basis of the true inference called -----------

a. Law of detachment b. Implication

c. Conjection d. Resolution

62. The argument form with premises $p_1, p_2, \ldots\ldots, p_n$ and conclusion q is valid when $(p_1 \wedge p_2 \wedge \ldots\ldots \wedge p_n) \rightarrow q$ is a …………………

a. Contingency b. Contradiction

c. Tautology d. Proposition

63. The tautology ((p ∨ q) ^ ¬p) q is the basis of the rule of inference called

    a. Modus tollens   b. Addition

    c. Hypothetical Syllogism   d. Disjunctive Syllogism

64. The tautology (¬q ^ (p → q))→ ¬p is the basis of the rule of inference called

    a. Modus tollens   b. Resolution

    c. Modus Ponens   d. Conjunction

65. The name for the rule of inference $\frac{?x\ p(x)}{y\ p(c)}$ is …………….

    a. Universal instantiation   b. Universal generalisation

    c. Existential instantiation   d. Existential generalisation

66. The name for the rule of inference is $\frac{p(c) for\ an\ abitray\ C}{y ∄x\ p(x)}$ is ……………….

    a. Universal instantiation   b. Universal generalisation

    c. Existential instantiation   d. Existential generalisation

67. The name for the rule of inference is $\frac{∃x\ p(x)}{y\ p(c) for\ some\ element\ c}$ is ……………………

    a. Universal instantiation   b. Universal generalisation

    c. Existential instantiation   d. Existential generalisation

68. The name for the value of inference is $\frac{p(c) for\ an\ abitray\ C}{y ∄x\ p(x)}$ is …………………..

    a. Universal instantiation   b. Universal generalisation

    c. Existential instantiation   d. Existential generalisation

69. Law of detachment is another name for the rule of inference --------------------------

    a. Modus Ponens   b. Modus tollens

    c. Addition   d. Resolution

70. The final statement of the argument is called ………………..

    a. Premise   b. fallacu

    c. Conclusion   d. valid

71. A statement that is being proposed to be a true statement usually on the basis of some partial evidence, a heuristic argument, or the intuition of an expert is known as ………………

    a. Theorem   b. Proposition

    c. proof   d. Conjucture

72. A theorem that can be established directly from a theorem that has been proved is known as ………………….

    a. Proposition   b. Corollary

    c. Lemma   d. Conjucture

73. An integer a is a/an ……………. If there is an integer b such that $a = b^2$

    a. Perfect square b. odd

    c. rational d. positive

74. Proof by contrapisition is a/an …………………

    a. Direct proof b. vacuous proof

    c. indirect proof d. trivial proof

75. A proof of $p \to q$ which uses the fact that q is true is called ……………

    a. Vacuous proof b. trivial proof

    c. direct proof d. Indirect proof

76. A proof of $p \to q$ which uses the fact that p is false is called ……………

    a. Vacuous proof b. trivial proof

    c. direct proof d. Indirect proof

77. Which of the following is not a true statement

    a. Theorem b. Lemma

    c. Corollary d. Conjecture

78. We can prove that p is true if we can show that $\neg p \to (r \wedge \neg r)$ is true for some proposition r. Proofs of this type are called …………………

    a. Vacuous proof b. trivial proof

    c. proofs by contradiction d. direct proof

79. For any proposition r, $r \wedge \neg r$ is a ……………….

    a. tautology b. contradiction

    c. contingency d. Lemma

80. Proof by contradiction is a/an ……………………..

    a. direct proof b. Indirect proof

    c. Vacuous proof d. trivial proof

81. Some theorems can be proved by examining a relatively small number of examples. Such proofs are called …………………….

    a. direct proof b. exhaustive proof

    c. trivial proof d. Vacuous proof

82. A proof of a proposition of the form $\exists x\, p(x)$ is called a/an ……………….

    a. exhaustive proof b. trivial proof

    c. proof by cases d. existence proof

83. An existence proof of $\exists x\, p(x)$ given by finding an element a such that p(a) is true

a. exhaustive b. non constructive

c. constructive d. not valid

84. The author of the book "A mathematician's Apology" is

a. Hardy b. Ramanujan

c. Boole d. Cayley

85. What number is known as Ramaujan Number

a. 1279 b. 1927

c. 1297 d. 1729

86. The solutions of the equation $x^2 + y^2 = z^2$, where x, y ,z are integers are called

a. Pythagorean triples b. Fermat triples

c. Perfect squares d. Fermat squares

87. A variable that has a value 0 or 1 is called

a. Real variable b. complex variable

c. Boolean variable d. constant

88. A proof that there is exactly one element satisfying a specified property

a. Counter example b. Uniqueness proof

c. Exhaustive proof d. trivial proof

89. A proof that an element with a specified property exists that does not explicitly find such an element is

a. Constructive b. Exhaustive

c. non constructive d. trivial

90. An invalid argument form often used incorrectly as a rule of inference is

a. Proof b. Conjecture

c. theorem d. fallacy

91. A mathematical assertion that can be shown to be true

a. Theorem b. conjucture

c. axiom d. fallacy

92. A proof that $p \rightarrow q$ is true that proceeds by showing that q must be true when p is true

a. Vacuous Proof b. Trivial Proof

c. Direct Proof d. Indirect Proof

93. A number that can be expressed as the ratio of two integers p and q such that $q \neq 0$

a. Real number b. rational number

c. irrational number d. algebraic number

94. A proof that $p \rightarrow q$ is true that proceeds by showing that p must be false when q is false.

a. Trivial Proof b. Direct Proof
c. Proof by contra position d. Proof by contradictio

95. A statement that is assumed to be true and than can be used as a basis for proving theorems

a. axiom b. lemma
c. corollary d. conjecture

96. A proof that p is true based on the truth of the conditional statement $\neg p \rightarrow q$, where q is a contradiction

a. Trivial proof b. Direct proof
c. proof by contra position d. proof by contradiction

97. If x is a positive integer, then $\sqrt{x}$ is always

a. Positive integer b. irrational
c. real number d. rational

98. A statement in an argument, other that the final one

a. premise b. argument form
c. conclusion d. scope

99. Reasoning where one or more steps are based on the truth of the statement being proved

a. Direct proof b. circular reasoning
c. vacuous proof d. logical reasoning

100. A demonstration that a theorem is true

a. axiom b. fallacy
c. rule of inference d. proof

ANSWER KEY

FOUNDATIONS OF MATHEMATICS (MODULE III & IV)

1. D	2. C	3. A	4. C	5. D	6. B	7.B
8. C	9. D	10. A	11. C	12. A	13. B	14.D
15.D	16.C	17.A	18.C	19.B	20.A	21.A
22.C	23.D	24.B	25.D	26.D	27.C	28.B
29.C	30.A	31.C	32.B	33.A	34.A	35.D
36.C	37.D	38.A	39.A	40.C	41.A	42.B
43.D	44.C	45.D	46.C	47.C	48.A	49.B
50.D	51.A	52.B	53.A	54.D	55.B	56.C
57.B	58.D	59.D	60.B	61.A	62.C	63.D
64.A	65.A	66.B	67.C	68.D	69.A	70.C
71.D	72.B	73.A	74.C	75.B	76.A	77.D
78.C	79.B	80.B	81.B	82.D	83.C	84.A
85.D	86.A	87.C	88.B	89.C	90.D	91.A
92.C	93.B	94.C	95.A	96.D	97.C	98.A
99.B	100.D					