Seat No.	

ENT-25

Total No. of Pages : 13

Shivaji University, Kolhapur
M.Sc. Entrance Examination, May-2023
Mathematics (SET-2)
Subject Code: 58716

Day and Date : Tuesday, 08-08-2023 **Total Marks : 100**

Time : 01.00 p.m. To 02.30 p.m.

Instruction : 1) All questions are compulsory.

2) Each question carries 1 marks.

3) Choose the correct alternative.

1. Let G be a finite group. If $H = \{x \in G | xg = gx \text{ for all } g \in G\}$, then which of the following statement is **not** correct?
(A) H is subgroup of G.
(B) H is called centre of G
(C) $o(H)$ divides $o(G)$.
(D) H is not abelian.

2. If H and K are finite subgroups of a group G, then $o(HK) =$__________.
(A) $\frac{o(H)+o(K)}{o(H\cap K)}$
(B) $\frac{o(H)o(K)}{o(H\cap K)}$
(C) $\frac{o(H\cap K)}{o(H)o(K)}$
(D) $\frac{o(H\cap K)}{o(H)+o(K)}$

3. Let G be a group. Consider the following statements:
I) G is abelian.
II) $G' = \{e\}$. Then
(A) Only I) $\Rightarrow$ II)
(B) Neither I) $\Rightarrow$ II) nor II) $\Rightarrow$ I)
(C) I) $\Leftrightarrow$ II)
(D) Only II) $\Rightarrow$ I)

4. $o(S_3) =$______.
(A) 3
(B) 6
(C) 2
(D) ∞

5. $Z_p = \{0, 1, 2, \cdots, p-1\}$ modulo p is a field if p is _______.
(A) finite
(B) odd
(C) even
(D) prime

6. An element e in a ring R is called ____ if $e^2 = e$.
   (A) unit
   (B) invertible
   (C) idempotent
   (D) nilpotent

7. A ring $R \neq \{0\}$ is called a ______ ring if R has no ideals except R and $\{0\}$
   (A) boolean
   (B) commutative
   (C) division
   (D) simple

8. Let $f: R \to R'$ be a ring homomorphism. Consider the following statements:
   I) $Ker\ f$ is an ideal of R.
   II) $Ker\ f = \{0\} \Rightarrow f$ is one − one. Then
   (A) Both I) and II) are true.
   (B) Both I) and II) are false.
   (C) Only I) is true.
   (D) Only II) is true.

9. Consider the following statements:
   I) $8x^3 + 6x + 1 \in Z[x]$ is primitive.
   II) $8x^3 + 6x + 2 \in Z[x]$ is primitive. Then
   (A) Both I) and II) are true.
   (B) Both I) and II) are false.
   (C) Only I) is true.
   (D) Only II) is true.

10. Let $f(x) = x + 1 \in Z_2[x]$. Then $[f(x)]^2 =$____ in $Z_2[x]$.
   (A) 1
   (B) $1 + x^2$
   (C) x^2
   (D) $1 - x^2$

11. If $z = -1$ then its Principal argument is Arg $(z) = \cdots$

   A) π B) $\frac{\pi}{2}$ C) 2π D) 0

12. If $(z) = u(x, y) + iv(x, y)$, then the Cauchy-Riemann equations are …

   A) $u_x = -v_y, u_y = v_x$ B) $u_x = v_y, u_y = v_x$

   C) $u_x = -v_y, u_y = -v_x$ D) $u_x = v_y, u_y = -v_x$

13. If $f(z) = x^3 + i(1 - y)^3$, then $f'(i) = \cdots$

   A) i B) $-i$ C) 0 D) $\bar{z}$

14. If $f(z) = u(x,y) + iv(x,y)$ is an analytic function such that $\bar{f}(z) = u(x,y) - iv(x,y)$ is also analytic then the function $f(z)$ is...

A) does not exist B) constant C) only a zero function D) an identity function

15. The value of the contour integral $\int_C \frac{dz}{z} = \cdots$, where C is the top half $z = e^{i\theta}(0 \le \theta \le \pi)$ of the circle $|z| = 1$ from $z = 1$ to $z = -1$.

A) πi B) $2\pi i$ C) $-\pi i$ D) $-2\pi i$

16. If C is the arc of the circle $|z| = 2$ from $z = 2$ to $z = 2i$ lying in the first quadrant then $\left|\int_C \frac{dz}{z^4+1}\right| \le \ldots$

A) $\frac{1}{15}\pi$ B) $\frac{2}{15}\pi$ C) $\frac{3}{15}\pi$ D) $\frac{4}{15}\pi$

17. The series of complex numbers $\sum_{n=0}^{\infty}\left(\frac{1}{2} + i\frac{1}{2}\right)^n$ is...

A) divergent B) converges to $\frac{1}{\frac{1}{2}+i\frac{1}{2}}$

C) converges to $\frac{1}{\frac{1}{2}-i\frac{1}{2}}$ D) converges to $\frac{-1}{\frac{1}{2}+i\frac{1}{2}}$

18. If $f(z) = e^{1/z}$ then $z = 0$ is ... singularity of $f(z)$

A) Removable B) simple Pole

C) Pole of any finite nonzero order D) essential

19. The value of the integral $\int_C \frac{(z+2)\,dz}{z^2(z+3)}$ taken counter clockwise around the circle $|z| = 2$ is .....

A) $\frac{2\pi i}{9}$ B) $2\pi i$ C) $-\frac{2\pi i}{9}$ D) $\frac{2\pi i}{3}$

20. The function $f(z) = \frac{z^3(z^2+1)}{(z+5)(z-4)}$ has .... simple zeros.

A) $z = 0,1,-1$ B) $z = 0, i, -i$ C) $z = -5, 4$ D) $z = i, -i$

21. If L{ f(t) } = f(s) then L{ f(t) / t} = ...

A) $\int_s^{\infty} f(t)ds$ B) $\int_s^{\infty} f(s)dt$

C) $\int_s^{\infty} f(s)ds$ D) $\int_s^{\infty} f(st)dt$

22. $L\{y''(t)\} = \ldots\ldots$

A) $s^2 L\{y\} - s\,y(0) - y'(0)$ B) $s\,L\{y\} + y(0)$

C) $sL\{y\} - y(0)$ D) $s^2 L\{y\} + sy(0) + y'(0)$

23. L{ $1/\sqrt{\pi t}$) } = ...

A) $\frac{2}{\sqrt{s}}$ B) $\frac{1}{\sqrt{2s}}$

C) $\frac{1}{\sqrt{s}}$ D) $\frac{1}{s}$

24. $L^{-1}\{ \frac{1}{s^2\,(s^2+1)} \}$ = ...

A) t - cost B) t - sint

C) t - 2sint D) t + cost

25. Infinite Fourier transform of F(x) = 1 , $|x| < k$

= 0 , $|x| > k$

where $F\{F(x)\} = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} F(x) e^{isx}\, dx$

A) $\sqrt{\frac{2}{\pi}}\,\frac{cossk}{s}$ B) $\sqrt{\frac{2}{\pi}}\,\frac{tansk}{s}$

C) $\sqrt{\frac{2}{\pi}}\,\frac{sinsk}{s}$ D) $\sqrt{\frac{2}{\pi}}\,\frac{sinsk}{k}$

26. The circular sinθ = ...

A) $\frac{e^{i\theta} - e^{-i\theta}}{2i}$ B) $\frac{e^{i\theta} - e^{-i\theta}}{2}$

C) $\frac{e^{i\theta} + e^{-i\theta}}{2i}$ D) $\frac{e^{i\theta} + e^{-i\theta}}{2}$

27. If L{ f(t) } = f(s) then L{ f(at) } = $\frac{1}{a}$f(s/a) . This is ....

A) change of scale property B) second shifting theorem

C) effect of division D) first shifting theorem

28. L { $e^{at} t^n$ } = ... s > a

A) $\frac{n!}{(s-a)^{n+1}}$ B) $\frac{n!}{(s+a)^{n+1}}$

C) $\frac{n}{(s-a)^{n+1}}$ D) $\frac{n!}{(s-a)^{n}}$

29. *The value of* $\int_0^{\infty} te^{-3t} sint\ \ dt$ = ...

A) $\frac{11}{50}$ B) $\frac{10}{49}$

C) $\frac{3}{50}$ D) $\frac{12}{35}$

30 . Infinite Fourier sine transform of $F(x) = \frac{1}{x}$ over $0 < x < \infty$ is …………..,

where $f_s(s) = \sqrt{\frac{2}{\pi}} \int_0^\infty F(x) \sin sx \, dx$

A) $\sqrt{\frac{\pi}{4}}$ B) $\sqrt{\frac{2}{\pi}}$

C) $\sqrt{\frac{\pi}{2}}$ D) $\sqrt{\frac{3}{\pi}}$

31. If W is a subspace of V then there exists an onto linear transformation $\theta : V \rightarrow \frac{V}{W}$ such that $\ker \theta$ = ________________.

A) V B) $\frac{V}{W}$ C) $\frac{W}{V}$ D) W

32. If $T : V \rightarrow U$ is a homomorphism , then $\ker T = \{ 0 \}$ iff ______________.

A) T is one - one B) T is onto

C) T is neither one – one nor onto D) none of these

33. The norm of vector (4, 2, 2, – 6) with respect to Euclidean inner product is ________.

A) 60 B) $2\sqrt{15}$ C) 14 D) $4\sqrt{15}$

34. If V is an inner product space and $x, y \in V$ are orthogonal vectors, then $\|x + y\|^2 =$ ____

A) $2(\|x\|^2 + \|y\|^2)$ B) $\|x\|^2 - \|y\|^2$

C) $2(\|x\|^2 - \|y\|^2)$ D) $\|x\|^2 + \|y\|^2$

35. Let $B = \{e_1 = (1,0,0),\ e_2 = (0,1,0),\ e_3 = (0,0,1)\}$ be the standard ordered basis for $\mathbb{R}^3$ and $F: \mathbb{R}^3 \longrightarrow \mathbb{R}^3$ be a linear transformation. If $F(e_1) = (1,3,5)$, $F(e_2) = (2,4,6)$, $F(e_3) = (7,7,7)$, then the matrix of F is $[F]_B = $ ………

A) $\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \\ 7 & 7 & 7 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 2 & 7 \\ 3 & 4 & 7 \\ 5 & 6 & 7 \end{bmatrix}$

B) $\begin{bmatrix} 2 & 4 & 6 \\ 7 & 7 & 7 \\ 1 & 3 & 5 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

36. Let c be an eigen value of a linear operator T on V. Then the set $\{v \in V \mid T(v) = cv\}$ is called ……… of T.

A) eigen space C) range

B) null space D) kernel

37. If T: V $\rightarrow$ W is a linear transformation and if dim V = 5 and Nullity T = 3, then Rank T = ____________.

A) 8 B) 2 C) 3 D) 5

38. If V is an Inner product space and x, y $\in$ V then $\|x+y\|^2 + \|x-y\|^2 =$ ____________.

A) $2\left(\|x\|^2 - \|y\|^2\right)$ B) $\|x\|^2 + \|y\|^2$ C) $2\left(\|x\|^2 + \|y\|^2\right)$ D) $\|x\|^2 - \|y\|^2$

39. If T : V $\rightarrow$ U is a linear transformation , then Range T is ________________ .

A) a subspace of U B) equal to V C) a subspace of V D) none of these

40. If T : $V_3 \rightarrow V_2$ and S : $V_3 \rightarrow V_2$ are two linear transformations defined by $T(x_1, x_2, x_3) = (x_1 - x_2, x_2 + x_3)$ and $S(x_1, x_2, x_3) = (2x_1, x_2 - x_3)$ then $(S+T)(x_1, x_2, x_3) =$ ________________ .

A) $(2x_1\ \ x_2 - x_3)$ B) $(2x_2, 3x_1 - x_2)$ C) (x_1, x_2, x_3) D) $(3x_1 - x_2, 2x_2)$

41. The maximum degree of any vertex in a simple graph with n vertices is

A) n-1 B) n+1 C) 2n-1 D) n

42. Let G be a simple graph. Which of the following statements is true?

P: Adjacency matrix is symmetric.

Q: Trace of adjacency matrix is 1.

A) P only B) Q only C) Both P and Q D) Neither P nor Q

43. A full binary tree of height h has --------- leaves.

A) 2h B) h-1 C) h D) 2^h

44. Let the graphs G_1 and G_2 be isomorphic. Then

A) both G_1 and G_2 have same number of vertices and edges.

B) both G_1 and G_2 have same number of circuits.

C) both G_1 and G_2 have same number of odd vertices.

D) all the options are correct.

45. How many non-isomorphic graphs are possible with 6 vertices and 6 edges and the degree of each vertex is 2?

A) 2 B) 3 C) 4 D) 5

46. The binary number 100110110101001 is equivalent to a hexadecimal number

A) 3DB9 B) 4DA9 C) 4CA8 D) 39EB

47. Which of the following is not the rule of inference?

A) Modus Ponens B) Transitivity C) Elimination D) Contradiction

48.

Which of the following statements is a Tautology?

(A) $(p \to q) \leftrightarrow (\neg q \to \neg p)$

(B) $(p \to q) \to (p \wedge q)$

(C) $p \wedge \neg q$

(D) $(p \wedge \neg q) \wedge (\neg p \vee q)$

49. Let P(x) denote the statement x > 7: Which of these have truth value true?

A) P(0) B) P(4) C) P(6) D) P(9)

50. What is the nature of a logical argument? Choose the correct answer from the following.

A) Justified or unjustified B) True or false C) Valid or invalid D) Verifiable or not verifiable

51. If $f(x) = x^2$ for all $x \in [0, 1]$ and $D = \left\{0, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, 1\right\}$ be a partition of [0, 1], then $L(f, D)$ and $U(f, D)$ are respectively ....

A) $\frac{15}{32}, \frac{7}{32}$

B) $\frac{7}{32}, \frac{15}{32}$

C) 15, 7

D) 7, 15

52. If g is continuous function on $[a, b]$ that is differentiable on (a, b) and if g' is integrable on $[a, b]$ then $\int_a^b g' =$.............

A) $g(x)$

B) $g'(b) - g'(a)$

C) $g(a) - g(b)$

D) $g(b) - g(a)$

53. Every constant function $f(x) = c$ is .... on any interval $[a, b]$.

A) Riemann integrable

B) not Riemann integrable

C) discontinuous

D) removable discontinuous

54. Let f be a bounded function defined on [a, b] and let P and P^* be the partitions of [a, b]. If $P \subseteq P^*$, then ....

A) $L(f, P^*) \leq L(f, P)$

B) $L(f, P^*) = L(f, P)$

C) $U(f, P^*) \leq U(f, P)$

D) $U(f, P^*) \geq U(f, P)$

55. $\int_b^\infty \frac{x^{3/2}}{\sqrt{(x^4-a^4)}}dx$, where $b > a$, is ....

A) Convergent
B) divergent
C) Oscillatory
D) proper integral

56. The series $\sum_{n=1}^\infty \frac{1}{n^2+1}$ is ....

A) divergent
B) convergent
C) oscillatory
D) none of these

57. The mesh of partition P is .... of the subinterval comprising P.

A) Minimum length B) Maximum length C) Equal D) none

58. When $f(x)$ is odd function then for Fourier series in $[-\pi,\pi]$, then a_0 =...........

A) 0 B) 2 C) ∞ D) -1

59. If $f(x)$ is expanded in a Fourier series of

$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx$$

Then a_0 =..............

A) 0
B) $\frac{1}{\pi}\int_0^\pi f(x)dx$
C) $\frac{2}{\pi}\int_0^\pi f(x)dx$
D) $\frac{\pi}{2}\int_0^\pi f(x)dx$

60. $\int_0^1 x^{m-1}(1-x)^{n-1}\,dx$ is convergent if ....

A) $m > 0,\ n < 0$
B) $m < 0,\ n > 0$
C) $m > 0,\ n > 0$
D) $m < 0,\ n < 0$

61. A sequencing involving six jobs and three machines requires evaluation of :

A) (6!+6!+6!) sequences
B) $(6!)^3$ sequences
C) $(6)^3$ sequences
D) (6+6+6) sequences

62. In sequencing algorithm____________.

A) The selection of an appropriate order for a series of jobs is to be done on a finite service facilities
B) All the jobs must be processed on a first-come-first service basis
C) A service facility can process more than one job at a time
D) All the service facilities are not of different type

63. In sequencing problems __________.

A) All jobs are completely known and ready for processing.
B) Jobs are processed sequentially, i.e., first on the first machine and then on the second machine and so on.
C) Total elapsed time is determined by the point of time at which the first of the n jobs goes to machine A until the time when the last job comes of the machine B.
D) All of the above.

64. Which statement is true about the game $\begin{bmatrix} 5 & 0 \\ 0 & 2 \end{bmatrix}$?

A) Game is fair.
B) Game is strictly determinable.
C) Game is not strictly determinable.
D) All of the above.

65. Using Dominance method following matrix can be reduced to __________ .

$$\begin{bmatrix} 10 & 5 & -2 \\ 13 & 12 & 15 \\ 16 & 14 & 10 \end{bmatrix}$$

A) $\begin{bmatrix} 10 & 5 \\ 13 & 12 \end{bmatrix}$
B) $\begin{bmatrix} 5 & -2 \\ 12 & 15 \end{bmatrix}$
C) $\begin{bmatrix} 13 & 15 \\ 16 & 10 \end{bmatrix}$
D) $\begin{bmatrix} 12 & 15 \\ 14 & 10 \end{bmatrix}$

66. To convert unbalanced transportation problem with total supply equals to 400 & total demand equals to 500 into balanced problem we add_________ .

A) dummy column with demand 100
B) dummy column with demand 200
C) dummy row with supply 100
D) dummy row with supply 200

67. Every basic feasible solution of a general assignment problem, having a square payoff matrix of order n should have assignments equal to _________.

A) 2n+1
B) m+n
C) m+n-1
D) 2n-1

68. For a salesman, who has to visit n cities, following are the ways of his tour plan:

A. n B) n! C) (n-1)! D) (n+1)!

69. An optimization model ___________.

A) Mathematically provides the best decision
B) Provides decision within its limited context
C) Helps in evaluating various alternatives constantly
D) All of the above

70. A constraint in an LPP restricts_________.

A) Value of an objective function
B) Value of a decision variable
C) Use of available resources
D) Uncertainty of optimum value

71. The set $\bar{E}$ of all limit points of E is called the _______

A) open set B) Closure of E C) connected set D) compact

72. The union of countable collection of closed sets is

A) always open B) always closed
C) need not be closed D) neither closed nor open

73. If f and g are continuous functions from a metric space M_1 into a metric space M_2 then which of the following statement is false ?

A) f + g is always continuous on M_1

B) f – g is always continuous on M_1

C) f.g is always continuous on M_1

D) $\frac{f}{g}$ is always continuous on M_1

74. The set in metric space X is open if and only if its complement is__________

A) closed B) open C) always empty set D) always X

75. Every subset of R_d is -----.

A) both open and closed B) only open
C) only closed D) neither open nor closed.

76. Let <X,d > and <Y,ρ > be two metric spaces and $f : X \rightarrow Y$ is function .Then f is continuous if and only if $f^{-1}(G)$ is open in X whenever -------.

A) G is closed in X B) G is open in X

C) G is neither open nor closed D) G is open in Y

77. If f is continuous at a and if c $\in$R then cf is continuous

A) on R B) at a C) at c D) at a.c

78. In any metric space <M, ρ>

A) Both M and empty set are open sets. B) Only M is open set

C) Only Empty set is open set. D) Both are neither open nor closed sets.

79. If E is any subset of metric space M then which of the following statement is true ?

A) E $\subset \bar{E}$ B) E is closed subset of M if E = $\bar{E}$

C) E is closed and $\bar{E} = \bar{\bar{E}}$ D) All the statements in A), B) and C) are true.

80. Let <X,d > and <Y,ρ > be two metric spaces and f : X → Y be a function.

Then f is continuous if and only if $\overline{f^{-1}(B)} \subset f^{-1}(\bar{B})$ for every ------------.

A) set B of X B) subset B of X

C) set B of Y D) subset B of Y

81. If $f: A \rightarrow B$ and if $X \subseteq B, Y \subseteq B$ then

A) $f^{-1}(X \cap Y) \neq f^{-1}(X) \cap f^{-1}(Y)$ B) $f^{-1}(X \cup Y) = f^{-1}(X) \cap f^{-1}(Y)$

C) $f^{-1}(X \cap Y) = f^{-1}(X) \cup f^{-1}(Y)$ D) $f^{-1}(X \cup Y) = f^{-1}(X) \cup f^{-1}(Y)$

82. If $f(x) = 1 + cosx\ (-\infty < x < \infty)$ and $g(x) = x^2 (0 \leq x < \infty)$ then $g \circ f(x)$=.....

A) $1 + cos^2 x$ C) $1 + cos(x^2)$

B) $1 + cos^2 x + 2\cos x$ D) $1 + \cos(x^2) + 2\cos x$

83. If $\{S_n\} = \{n\,(1 + (-1)^n)\,\}^{\infty}_{n=1}$, then $\lim_{n->\infty} Inf\, S_n$ =________

A) ∞ B) -1 C) 0 D) 1

84. Consider two statements

I) Every absolutely convergent series is convergent

II) Every Cauchy sequence of real numbers is not bounded

A) Only I) is true B) Only II) is true

C) Both I) and II) are true D) Both I) and II) are false

85. The series $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{1}{n^p}$ converges for _____

A) $P < 0$ B) $P > 0$

C) $P = 0$ D) $P = -1$

86. The factor group of an abelian group is ….

A) cyclic B) neither abelian nor cyclic

C) abelian D) none of these

87. A non-zero element 'a' of a commutative ring R is called a .... if there exists some non zero element b in R such that ab=0.

A) Zero divisor B) no zero divisor C) nilpotent D) idempotent

88. The order of symmetric group s_5 is....

A) 40 B) 60 C)120 D)100

89. The diagonal elements of the .... matrix are either purely imaginary or zero.

A) Hermitian B) Skew- Hermitian

C) symmetric D) Skew- symmetric

90. For the Euler's function ϕ, $\phi(16) =$__________

A) 6 B) 7 C) 8 D) 9

91. The integrating factor of the differential equation $\frac{dy}{dx} + \frac{2x}{1+x^2}\, y = \sin x$ is _______ .

A) $1 + x^2$ B) $\dfrac{1}{1+x^2}$

C) $\dfrac{2x}{1+x^2}$ D) $\dfrac{1+x^2}{2x}$

92. Which of the following is Bernoulli's differential equation?

A) $\dfrac{dy}{dx} + Py = Q$ B) $\dfrac{dy}{dx} + Px = Q$

C) $\dfrac{d^2y}{dx^2} + Py = Q$ D) $\dfrac{dy}{dx} + Py = Qy^n$

93. The Particular integral of $(D-2)\,(D+2)\,y = e^{2x}$ is ________ .

A) e^{2x} B) $\dfrac{1}{4}e^{2x}$

C) $\dfrac{x}{4}\,e^{2x}$ D) xe^{2x}

94. The differential equation $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x$ is of the type ________.

A) Legendre's linear differential equation B) Homogeneous differential equation.

C) Linear differential equation D) Bernoulli's differential equation

95. The complete solution of $p + q + pq = 0$ is _______ .

A) $z = ax + ay + c$

B) $z = ax + \frac{a}{a+1}y + c$

C) $z = ax + c$

D) $z = ax - \frac{a}{a+1}y + c$

96. A continuous function defined on a closed interval is ________.

A) uniformly continuous

B) unbounded

C) bounded

D) All of these

97. $\lim_{x \to 1} \frac{\log x}{x-1} =$ _________ .

A) ∞

B) 1

C) 0

D) 2

98. The functions $f(x) = x^2$ and $g(x) = x$ satisfies all conditions of Cauchy's mean value theorem on $[a, b]$. Then the value of $c =$ _______.

A) $\frac{a-b}{2}$

B) $\frac{a+b}{2}$

C) ab

D) $\frac{b-a}{2}$

99. If $y = a^{5x}$, then the 30th derivative of y is $y_{30} =$_____.

A) $5^{30}a^{5x}$

B) $5^{30}(\log a)^{30}$

C) $5^{30}(\log a)a^{5x}$

D) $5^{30}(\log a)^{30}a^{5x}$

100. If $z = \frac{xy}{x+y}$ then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} =$ ________.

A) z

B) 0

C) $2z$

D) z^2