DEPARTMENT OF MATHEMATICS

UNIVERSITY OF BENIN, BENIN CITY

COURSE CODE: MTH230 (Linear Algebra-2021/2022 Continuous Assessment)

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Mat. No. [redacted]

INSTRUCTION: YOU MUST SUBMIT YOUR QUESTION PAPER ALONG WITH YOUR ANSWER SHEET.

1. What is the Cartesian product of set A and set B, if the set A = {1, 2} and set B = {a, b}?
(a). {(1, a), (1, b), (2, a), (b, b)} (b). {(1, 1), (2, 2), (a, a), (b, b)} (c). {(1, a), (2, a), (1, b), (2, b)}
(d). {(1, 1), (a, a), (2, a), (1, b)}.

2. If x is a set and the set contains an integer which is neither positive nor negative then the set x is
(a) Set is Empty (b) Set is Non-empty (c) Set is finite. (d) Set is both Non- empty and finite.

3. The intersection of the sets {1, 2, 8, 9, 10, 5} and {1, 2, 6, 10, 12, 15} is the set: (a) {1, 2, 10}
(b) {5, 6, 12, 15} (c) {2, 5, 10, 9} (d) {1, 6, 12, 9, 8}

4. If n(A) = 20 and n(B) = 30 and n(A U B) = 40 then n(A ∩ B) is (a) 20 (b) 30 (c) 40 (d) 10

5. Let the players who play cricket be 12, the ones who play football 10, those who play only cricket are 6, then *the number of players who play only football are* __, assuming there is a total of 16 players.
(a) 16 (b) 8 (c) 4 (d) 10

6. *The Cartesian product of the (Set Y)* x (Set X) is equal to the Cartesian product of (Set X) x (Set Y) or Not?
(a) Yes (b). No (c). None of the above (d). I don't know

7. *Which statement is incorrect if* X and Y are the two non-empty relations on the set S.

(a) If X and Y are transitive, then the intersection of X and Y is also transitive.

(b) If X and Y are reflexive, then the intersection of X and Y is also reflexive.

(c) If X and Y are symmetric, then the union of X and Y is not symmetric.

(d) If X and Y are transitive, then the union of X and Y is not transitive.

8. Given the equations are 4x+2y+z=8, x+ y+ z=3, 3x+y+3z=9. Find the values of x, y and z.
(a) 5/3, 0, 4/3 (b) 1, 2, 3 (c) 4/3, 1/3, 5/3 (d) 2, 3, 4

9. Find the values of x, y, z and w from the expression $5\begin{pmatrix} x & z \\ y & w \end{pmatrix} = \begin{pmatrix} 2 & 10 \\ 3 & 2x+y \end{pmatrix} + \begin{pmatrix} z & 5 \\ 7 & w \end{pmatrix}$.

(a) x=1, y=3, z=4, w=0 (b) x=2, y=3, z=8, w=1 (c) x=1, y=2, z=3, w=1 (d) x=1, y=2, z=4, w=1

10. Find the inverse of the matrix $A = \begin{pmatrix} 8 & 5 & 2 \\ 4 & 6 & 3 \\ 7 & 4 & 2 \end{pmatrix}$

(a) $\begin{pmatrix} 0 & -\frac{2}{13} & \frac{3}{13} \\ 1 & \frac{2}{13} & -\frac{16}{13} \\ -2 & \frac{3}{13} & \frac{28}{13} \end{pmatrix}$ (b) $\begin{pmatrix} \frac{1}{13} & \frac{-2}{13} & \frac{3}{13} \\ \frac{16}{13} & \frac{2}{13} & \frac{-16}{13} \\ \frac{2}{28} & \frac{3}{13} & \frac{28}{13} \end{pmatrix}$ (c) $\begin{pmatrix} \frac{1}{13} & \frac{-2}{13} & \frac{3}{13} \\ \frac{16}{13} & \frac{2}{13} & \frac{-16}{13} \\ \frac{-2}{13} & \frac{3}{13} & \frac{28}{13} \end{pmatrix}$ (d) $\begin{pmatrix} \frac{1}{13} & \frac{-2}{13} & \frac{3}{13} \\ \frac{16}{13} & \frac{2}{13} & \frac{-16}{13} \\ \frac{1}{13} & \frac{3}{13} & \frac{28}{13} \end{pmatrix}$

11. By Crammer's rule the solution to the set of equations $a + 2b - c = 2$, $3a + 6b + c = 1$, $3a + 3b + 2c = 3$ is $(a, b, c) =$ (a) $(\frac{35}{12}, \frac{-13}{12}, \frac{-5}{4})$ (b) $(\frac{35}{12}, \frac{-1}{12}, \frac{-5}{4})$ (c) $(\frac{5}{12}, \frac{-1}{12}, \frac{-4}{5})$ (d) does not have a unique solution.

12. Find the rank of the matrix $A = \begin{pmatrix} 1 & 3 & 5 \\ 4 & 6 & 7 \\ 1 & 2 & 2 \end{pmatrix}$. (a) 3 (b) 2 (c) 1 (d) 0

13. The inverse of a matrix A is written as A^{-1} so that $AA^{-1} = A^{-1}A =$ (a) Identity matrix (b) Null matrix (c) Singular matrix (d) Inverse matrix

14. If a square matrix B is skew symmetric then. (a) $B^T = -B$ (b) $B^T = B$ (c) $B^{-1} = B$ (d) $B^{-1} = B^T$

15. A function or mapping (Defined as f: X->Y) is a relationship from elements of one set X to elements of another set Y, then X is called? (a). Codomain (b). Pre-image (c). Domain (d). Image of function

16. f: N->N,f(x)=5x is? (a). injective (b). not injective (c). surjective (d). inverse

17. Compute the determinant of the matrix $A = \begin{pmatrix} 4 & 2 & 7 \\ 9 & 3 & 5 \\ 7 & 9 & 4 \end{pmatrix}$. (a) 1084 (b) -286 (c) 286 (d) 146

18. W is the set of all vectors of the form $(a-4b, 6, 6a+b, -a-b)^T$, where a and b are arbitrary real numbers. If the set W is a vector space, find a set S of vectors that spans it. Otherwise, state that W is not a vector space. (a) $(1,6,6,-1)^T$, $(-4,0,1,-1)^T$ (b) Not a vector space (c) $(1,0,6,-1)^T$, $(-4,6,1,-1)^T$ (d) $(1,0,6,-1)^T$, $(-4\ 0\ 1\ -1)^T$, $(0\ 6\ 0\ 0)^T$

19. Determine which of the sets of vectors is linearly independent.

(I). The set p_1, p_2, p_3 where $p_1(t) = 1$, $p_2(t) = t^2$, $p_3(t) = 3+3t$

(II). The set p_1, p_2, p_3 where $p_1(t) = t$, $p_2(t) = t^2$, $p_3(t) = 2t + 3t^2$

(III). The set p_1, p_2, p_3 where $p_1(t) = 1$, $p_2(t) = t^2$, $p_3(t) = 3 + 3t + t^2$

(a). III only (b) all of them (c) I only (d) II only (e) I and III

20. Let A = [-5 2] and B = [1 0] be two matrices. Find 2A+3B. (a) [-10 4] (b) [-2 2] (c) [-9 4] (d) [-7 4]

21. Give matrix $A = \begin{pmatrix} 4 & 2 & 7 \\ 9 & 3 & 5 \\ 7 & 9 & 4 \end{pmatrix}$. The characteristic polynomial is

(a) $286-72\lambda-11\lambda^2-\lambda^3=0$ (b) $286-72\lambda+11\lambda^2+\lambda^3=0$ (c) $286+72\lambda+11\lambda^2-\lambda^3=0$ (d) $286-72\lambda-11\lambda^2+\lambda^3=0$

22. Give matrix $A = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{pmatrix}$. The eigenvalues are (a) $\lambda_1 = -1, \lambda_2 = 0, \lambda_3 = 1$ (b) $\lambda_1 = 1,\ \lambda_2 = 0,\ \lambda_3 = 1$

(c) $\lambda_1 = -1,\ \lambda_2 = 1,\ \lambda_3 = 1$ (d) $\lambda_1 = 0,\ \lambda_2 = 0,\ \lambda_3 = 1$

23. In given system of equation $Ax = B$, if $\det(A) \neq 0$ then system has (a) unique solution (b) no solution (c) infinitely many solutions (d) n-r solutions.

24. Given system of linear equations $x-4y+5z=-1$, $2x-y+3z=1$, $3x+2y+z=3$ has (a) no solution (b) unique solution (c) infinitely many solutions (d) n-r solutions

25. Consider the matrix $A = \begin{pmatrix} 2 & 3 \\ x & y \end{pmatrix}$. If the eigenvalues of A are 4 and 8, then (a) x=4, y=10 (b) x=5, y=8 (c) x = -3, y = 9 (d). x = -4, y =10

26. If a matrix $A = [a_{11}\ a_{12} \cdots a_{1n}\ a_{21} \cdots a_{2n} \vdots \vdots\ a_{n1}\ a_{n2} \cdots a_{nn}]$, order (nxn) $a_{ii} = 1$, $a_{ij} = 0$ for $i \neq j$. Then that matrix is known as ___ (a) Identity matrix (b) Null matrix (c) Singular matrix (d) None of the mentioned

27. A matrix having many rows and one column is known as?
(a) Row matrix (b) Column matrix (c) Diagonal matrix (d) None of the mentioned

28. The trace of the matrix is defined as ___ (a) Sum of all the elements of the matrix (b) Sum of all the elements of leading diagonal of matrix (c) Sum of all non-zero elements of matrix
(d) None of the mentioned

29. Communicative law of addition matrices A and B means (a) AB (b) A+B (c) A+B= B+A (d) BA

30. Let A= $\begin{pmatrix} 3 & 2 \\ 1 & 0 \end{pmatrix}$, the cofactor of matrix is (a)) $\begin{pmatrix} 0 & -1 \\ 3 & -3 \end{pmatrix}$ (b) $\begin{pmatrix} 0 & 1 \\ 2 & 3 \end{pmatrix}$ (c) $\begin{pmatrix} 0 & -1 \\ 2 & 3 \end{pmatrix}$ (d) $\begin{pmatrix} 0 & -1 \\ -2 & 3 \end{pmatrix}$

31. The trace of matrix A is (a) $\sum_{i=1}^{i=n} a_{ii}$ (b) $\sum_{i=1}^{i=n} a_{ij}$ (c) $\sum_{i=1}^{i=n} a_{ji}$ (d) None of the solution

32. If A and B are two nxn matrices then Trace (A+B) implies (a) Trace (A+B) (b) Trace (A) + Trace(B) (c) Trace (AB) (d) All of the options

33. Given matrices A and B of such dimension that both product AB and BA exist are square matrices the Trace (AB) means (a) Trace (A+B) (b) Trace (AB)+Trace(B) (c) Trace (BA) (d) Trace (AB+BA)

34. The determinant of A^T is equal to (a) |A| (b) Trace (A) (c) A^T (d) A^{-1}

35. Given matrix $A = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$, $x = (x_1 \quad x_2)$. Then $Q = x^T A x$ is
(a) $x_1^2 - x_1 4x_2 + x_2^2$ (b) $x_1^2 + 4x_1x_2 + x_2^2$ (c) $x_1^2 + 4x_2x_2 + x_2^2$ (d)) $x_1^2 - 4x_1x_2 - x_2^2$

36. *A quadratic form is said to be negative definite:* (a) $Q < 0$, when $x \neq 0$ (b) $Q > 0$, when $x \neq 0$ (c) $Q = 0$, *when* $x \neq 0$ (d) $Q \geq 0$, *when* $x \neq 0$.

37. *For x in* R^3, *let* $Q(x) = 5x_1^2 + 3x_2^2 + 2x_3^2 - x_1x_2 + 8x_2x_3$. Write the quadratic form of Q(x) as $x^T Ax$

(a) $(x_1, x_2, x_2)\begin{pmatrix} -5 & 2 & 0 \\ -1/2 & 3 & -4 \\ 0 & 4 & 2 \end{pmatrix}\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$ (b) $(x_1, x_2, x_2)\begin{pmatrix} 5 & 2 & 0 \\ 0 & 4 & 2 \\ -1/2 & 3 & 4 \end{pmatrix}\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$

(c) $(x_1, x_2, x_2)\begin{pmatrix} 5 & -1/2 & 0 \\ 9 & 3 & 5 \\ 0 & 4 & 2 \end{pmatrix}\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$ (d) $(x_1, x_2, x_2)\begin{pmatrix} 5 & -1/2 & 0 \\ -1/2 & 3 & 4 \\ 0 & 4 & 2 \end{pmatrix}\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$

38. The vectors $v_1,\ldots,v_n$ in V form a basis of V if (a) they are linearly dependent and span V (b) they span V (c) they are linearly independent and span V (d) None of the solution is correct.

39. The dimension of vector space V is (a) the number *n* of vectors in a basis of the infinite-dimensional vector space V (b) the number *n* of finite-dimensional vector space V (c). a basis of the finite-dimensional vector space V (d) the number *n* of vectors in a basis of the finite-dimensional vector space V.

40. A linear system is called consistent if (a) it admits a solution (b) it admits no solution (c) it admits infinite solution (d) All of the above.

41. Which of the following are well-defined sets? (a). All the colors in the rainbow. (b). All the points that lie on a straight line. (c). All the honest members in the family. (d). All the efficient doctors of the hospital. (e). All the hardworking teachers in a school. (f). All the prime numbers less than 100

42. Write the following sets in the set builder form. (a). A= {2,6,8} (b). B= {3, 9, 27,81} (c). C = { 1, 4, 9, 16, 25} (d). D = {1,3,5, ….. } (e). E = { 4,6,8,9,10,12,14,15,16,18,20,…….52} (f). F={-10,……..-3,-2,-1,2,………..,5} (g). G={ 0} (h). P={ }.

43. Write the following sets in the roster form. (a). $A=\{x:x\in w, x\le 5\}$ (b). $B=\{x:x\in I-3<x<5\}$ (c). $C=\{x:x \text{ is divisible by } 12\}$ (d). $D=\{x:x^3 p, \in w, p\le 3\}$ (e). $E=\{x:x=a^2, a\in N, 3<a<7\}$ (f). $F=\{x:x=n(n+1), n\in N \text{ and } n\le 4\}$

44. Which of the following are the examples of an empty set (a). The set of even natural numbers divisible by 3 (b). The set of all prime numbers dividable by 2. (c). $\{x:x\in N, 5<x<6\}$ (d). The set of odd natural numbers divisible by 2. (e). P = { x : x is a prime number, 54, < x < 58} (f). Q= $\{x:x=2n+3, n\in w, n\le 5\}$

45. Which of the following is an example of an infinite set (a). The set of days in a week (b). A = $\{x:x\in Nx=1\}$ (c). B = {x: x is an even prime number} (d). D = { x : x is a factor of 30} (e). $P=\{x:x\in Z, x<-1\}$

46. Classify the following as finite set: (a). A = $\{x:x\in Nx>1\}$ (b). B = {x: x >1} (c). D = { x : x is a factor of 30} (d). P = $\{x:x\in Z, x<-1\}$

47. the set $A=\{x:x\in N, \text{ and } x^2-3x+2=0\}$ *is* (a). Null set (b). Finite set (c). Infinite set (d). None of these

48. The set $A=\{x, x\in R, \text{ and } x^2=9, 2x=4\}$ *is* (a). Empty set (b). Singleton set (c). Infinite set (d). None of these

48. let A = (x: x is a letter in the word FOLLOW) B = (y: y is a letter in the word WOLF) (a). A & B are disjoint (b). A = B (c). $A\subseteq B$ (d). None of these

49. Are The Following Pairs of Sets Equal? (a). $A=(2)$ $B=\{x:x\in N, x \text{ is an even prime number}\}$ (b). $P=\{q,s,m\}$ $Q=\{6,9,12\}$ (c). X = {x: x is a prime number less than 10}, Y = $\{x:x\in N, x\le 4\}$ (d). M= {a, b, c, d} N= {p, q, r, s} (e). D= {x: x is a multiple of 30}

50. Which of the following are equivalent sets (a). A = {2} B= {x: x $\in N$, x is an even prime number} (b). P = {1, 4, 9}, Q= {x: x = n^2, n$\in N, n\le 3$} (c). X= $\{x:x\in W, x<5\}$, Y = {x : x $\in N, x\le 5$} (d). M = {a, b, c, d}, N= {p, q, r, s} (e). D = {x: x is a multiple of 30}, E = {x : x is factor of 10}

51. If *If* $A\cap B^C=\phi$ then (a). A = B (b). $B\neq A$ (c). A is proper subset of B (d). None of these

52. A^c-B^c is equal to (a). B – A (b). A-B (c). A= B (d). None of these

53. If A = Ø then total number of elements in P (A) are (a). No element (b). Zero (c). Two (d). One

54. Let A = (a, b, c) and B = (1, 2) then the number of relations from A into B is (a). 6 (b). 5 (c). 32 (d). 64

55. Let R is the set of all triangles in a plane aRb iff a is congruent to b, then R is (a). Only reflexive (b). Only symmetric (c). Only transitive relation (d). Equivalence relation.

56. the relation " is parallel" on the set A of all coplanar straight line is: (a). Only reflexive (b). Only Symmetric (c). Only Transitive Relation (d). Equivalence relation

57. Let A= (a, b, c) and R = {(b, b), (c, a), (a, c)}, then the relation R on A is (a). Only reflexive (b). Only symmetric (c). Only Transitive relation (d). None of these.

58. The relation " congruence modulo m" is (a). An equivalence (b). Reflexive only (c). Symmetric only (d). Transitive only

59. A set has n elements, then the total number of proper subsets is (a). 2^n (b). 2^{n-1} (c). 2^{2n} (d). None of these

60. The sets A and B have 6 and 9 elements respectively, such that A is proper subset B, then the total number of elements $A \cap B$ are (a). 6 (b). 9 (c). 3 (d). 15

61. The sets A and B have 5 and 9 elements respectively, such that A is proper subset B, then the total number of laments $A \cup B$ is (a). 5 (b). 9 (c). 14 (d). 4

62. The smallest set A such that $A \cup (4,5) = (1,2,3,4,5)$ is (a). {3, 4, 5} (b). {1,2,3} (c). {1,2} (d). {1,2,3,4,5}

63. If X is a finite set containing *n* distinct elements, then total number of reaction on *x* are equal to (a). 2^n (b). 2^{n-1} (c). 2^{2n} (d). 2^{n2}

64. Which set is the subsets of all given sets (a). {1} (b). {0} (c). Ø (d). {0, 1, 6,7}

65. If A = (1, 2, 3) and B = (4, 5, 6} then, n(AxB) is equal to (a). 2^9 (b). 2^3 (c). 9^2 (d). 9

66. Let X = (1, 2, 3) then the relation R = {(1, 1), (2, 2), (3, 1)} on x is (a). Reflexive (b). Symmetric (c). Transitive (d). None of these

67. X and Y are two finite sets s.t O (X) = m & O (Y) = n then the number of relations from X to Y are (a). 2^{m+n} (b). m+n (c). mn (d). 2^{mn}

68. If A and B are sets such that n(A) = 15, n(B) = 21 and $n(A \cup B)$= 36 then $n(A \cap B)$ equal to (a). 2 (b). 0 (c). 4 (d).15

69. If P and Q are two sets such that $P \cap Q$ has 20 elements. P has 9 elements & Q has 16 elements. How many elements does $P \cap Q$ have? (a). 5 (b). 4 (c). 3 (d). 0

70. In a group of 300 people, 150 can speak French and 200 can speak German. How many can speak both French and German. (a). 40 (b). 50 (c). 20 (d). None of these

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

72. *The relation R defined on the set A= {1, 2, 3, 4, 5} by R = {(x, y): $|x^2 - y^2| < 16$} is given by*

(a). {1, 1), (2, 1),(3, 1),(4, 1),(2, 3)} (b). {(2,2),(3,2),(4,2),(2,4)} (c). {3,3), (4,3), (5,4), (3,40}

(d). None of the above

73. *If the binary operation * is defined on a set of ordered pairs of real numbers as* (a, b) * (c, d) = (ad+bc, bd) *and is associative then* (1, 2)* (3.5)* (3.5)* (3, 4) equals (a). (74, 40) (b). (32, 40) (c). (23, 11) (d). (7, 11)

74. If A = {1, 2, 3, 4}. LET ≈= {(1, 2), (1, 3) ,(4, 2)}. Then ≈ is (a). Not anti-symmetric (a). Transitive

(b). Reflexive (c). Symmetric (d). Anti-symmetric

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

(b). {(1,2),(2,3),(3,3)} (c). {(1,3),(2,3),(3,3)} (d). {(2,1),(1,3),(2,3)}

76. A binary operation * on a set of integers is defined as x, x*y = $x^2 + y^2$. Which one of the following statements is true about* (a). Commutative but not associative (b). Both commutative and associative

(c). Not commutative but associative (d). Neither commutative not associative

77. how many into (surjective) functions are there from an n- elements $(n \geq 2)$ set to a 2- elements set?

(a). 2^n (b). 2^n-1 (c). 2^n-2 (d). 2(2^n-2)

78. What is the possible number of reflexive relations on a set of 5 elements (a). 2^{10} (b). 2^{15} (c). 2^{20} (d). 2^{25}

79. *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 (a). R is symmetric* but Not antisymmetric (b). R is not symmetric but antisymmetric

(c). R is both symmetric and antisymmetric (d). R is neither symmetric nor antisymmetric

80. For a set A, the power set of A is denoted by 2^A. If A = {5, {6}, {7}}, which of the following operation are true? (a). $\phi \in 2^A$ (b). $\phi \subseteq 2^A$ (c). $\{5,\{6\}\} \in 2^A$ (d). $\{5,\{6\}\} \subseteq 2^A$

81. If f is a function from A to B, where 0 (A) = m & 0(B) = n, then total number of distinct functions are

(a). nm (b). n^m (c). m^n (d). m+n

82. A function f from N to N defined by f(n) = 2n+5 $\forall n \in n$ is (a). many – one function (b). into function

(c). onto function (d). bijective function

83. If 63% of persons like banana, where 76% like apple. What can be said about the percentage of persons who like both banana & apples? (a). 40 (b). 39 (c). 27 (d). 24

84. The number of equivalence relations of the set (1, 2, 3, 4) is (a). 4 (b). 15 (c). 16 (d). 24

85. Let A be a finite set of size n, the number of elements in the power set of AxA is (a). 2^{2n} (b). 2^{n^2} (c). 2^n

(d). None of these

86. If A = (x, y), the power set of A is (a). {{x}, {y}} (b). {{Ø}, {x, y} (c). {Ø,{x},{y}} (d). None of these

72. The relation R defined on the set A= {1, 2, 3, 4, 5} by R = {(x, y): $|x^2 - y^2| < 16$} is given by

(a). {1, 1), (2, 1),(3, 1),(4, 1),(2, 3)} (b). {(2,2),(3,2),(4,2),(2,4)} (c). {3,3), (4,3), (5,4), (3,40}

(d). None of the above

73. If the binary operation * is defined on a set of ordered pairs of real numbers as (a, b) * (c, d) = (ad+bc, bd) and is associative then (1, 2)* (3.5)* (3.5)* (3, 4) equals (a). (74, 40) (b). (32, 40) (c). (23, 11) (d). (7, 11)

74. If A = {1, 2, 3, 4}. LET ≈= {(1, 2), (1, 3) ,(4, 2)}. Then ≈ is (a). Not anti-symmetric (a). Transitive

(b). Reflexive (c). Symmetric (d). Anti-symmetric

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

(b). {(1,2),(2,3),(3,3)} (c). {(1,3),(2,3),(3,3)} (d). {(2,1),(1,3),(2,3)}

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79. 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 (a). R is symmetric but Not antisymmetric (b). R is not symmetric but antisymmetric (c). R is both symmetric and antisymmetric (d). R is neither symmetric nor antisymmetric

80. For a set A, the power set of A is denoted by 2^A. If A = {5, {6}, {7}}, which of the following operation are true? (a). $\phi \in 2^A$ (b). $\phi \subseteq 2^A$ (c). $\{5,\{6\}\} \in 2^A$ (d). $\{5,\{6\}\} \subseteq 2^A$

81. If f is a function from A to B, where 0 (A) = m & 0(B) = n, then total number of distinct functions are

(a). nm (b). n^m (c). m^n (d). m+n

82. A function f from N to N defined by f(n) = 2n+5 $\forall n \in n$ is (a). many – one function (b). into function

(c). onto function (d). bijective function

83. If 63% of persons like banana, where 76% like apple. What can be said about the percentage of persons who like both banana & apples? (a). 40 (b). 39 (c). 27 (d). 24

84. The number of equivalence relations of the set (1, 2, 3, 4) is (a). 4 (b). 15 (c). 16 (d). 24

85. Let A be a finite set of size n, the number of elements in the power set of AxA is (a). 2^{2n} (b). 2^{n^2} (c). 2^n (d). None of these

86. If A = (x, y), the power set of A is (a). { {x}, {y} } (b). { {Ø}, {x, y} (c). {Ø, {x}, {y} } (d). None of these

87. If A and B are sets and $A \cap B = A \cup B$, then (a). A= Ø (b). B= Ø (c). A= B (d). None of these

88. The domain and range are same for (a). Constant function (b). Identity function (c). Absolute value function (d). Greatest integer function

89. Set A has 3 elements & set B has 4 elements. The number of injections that can be defined from A into B is (a). 144 (b). 12 (c). 24 (d). 64

90. The number of bijective functions from set A to itself when A contains 106 is (a). 106 (b). 106^2 (c). 106! (d). 2^{106}

91. Let Z denote the set of all integers define f: $Z \to Z$ by $f(x) = \frac{x}{2}$. If x is even x, if x is odd then f is

(a). Into but not one- one (b). One – one but not onto (c). One- one & onto (d). Neither one-one nor onto

92. To have inverse for the function f, f is (a). One- one (b). Onto (c). One- one and onto (d). Identity function

93. if (x) denotes integral part of the real number, then the function f(x) = x- (x) is a/ an (a). Even function (b). Odd function (c). Periodic function (d). Constant

94. The function f: $Z \to Z$ given by $f(x) = x^2$ is (a). One- one (b). Onto (c). One- one and onto (d). None of these.

95. **Let A = {x: [illegible] < x < 1}= B**. the function $f(x) = x/2$ from A to B is (a). Injective (b). Surjective (c). Both injective and surjective (d). Neither injective nor surjective

96. A- $(B \cup C)$ is equal to (a). (A-B) $\cup$(A-C) (b). A-B-C (c). $(A-B) \cap (A-C)$ (d). (A-B) $\cup$C

97. The range of f(x) = Cos(x) is (a). {-1, 1} (b). {-1, 1} (c). {-1, 0, 1} (d). {-1, 1}

The range of the function f (x) = sin (x), $\pi/4 < x < \pi/4$ (a). {-1, 0, 1} (b). {-1, 1} (c). $\left\{-1/\sqrt{2}, -1/\sqrt{2}\right\}$ (d). {0, -sin1}

98. If f: $R \to R$ is defined by $f(x) = x^2 + 1$, then value of $f^{-1}(17)$ is (a). {-2, 2} (b). {-3, 3} (c). (-4, 4} (d). { $\sqrt{17}$, 1 }

99. The domain of $\sqrt{x-4}(x-3)$ is (a). $(-\infty, 3) \cup (4, \infty)$ (b). $(-\infty, -3) \cup (4, \infty)$ (c). $(-\infty, -3) \cup (0, \infty)$ (d). None of these

100. Find the domain of the function f defined by $f(x) = -1/(x+3)$ is (a). $(-\infty, -3) \cup (-3, \infty)$ (b). $(-\infty, -3) \cup (3, \infty)$ (c). $(-\infty, -3) \cup (0, \infty)$ (d). None of these

101. If A= $\begin{bmatrix} 2 & 4 & 6 \\ 8 & 5 & 3 \end{bmatrix}$, the order of matrix A is (a). 3x2 (b). 2x3 (c). 1x3 (d). 3 x 1

102. If A = [1 2 3], which type of the given matrix B? (a). Unit matrix (b). Row matrix (c). Column matrix (d). Square matrix

103. Mention the type of the matrix $A = \begin{bmatrix} 1 & -2 & 4 \\ -2 & 3 & 5 \\ 4 & 5 & 8 \end{bmatrix}$

(a). Symmetric matrix (b). Skew-symmetric matric (c). Null matrix (d). Identity matrix

104. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ is matrix of the type: (a). Zero matrix (b). Row matrix (c). Column matrix (d). Unit matrix

105. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is matrix of the type: (a). Zero matrix (b). Unit matrix (c). Row matrix (d). Column matrix

106. If $A = \begin{bmatrix} 4 & -5 & 2 \\ 0 & 6 & 9 \\ 2 & 7 & 8 \end{bmatrix}$, the diagonal elements are: (a). 4,6,8 (b). 4,0,2 (c). 2,6,2 (d). All of the above

107. If $A = \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 3 & 1 \end{bmatrix}$, the product BA is (a). $\begin{bmatrix} 3 & 2 \\ 13 & -2 \end{bmatrix}$ (b). $\begin{bmatrix} 3 & -2 \\ 13 & -7 \end{bmatrix}$ (c). $\begin{bmatrix} 3 & -2 \\ 13 & 7 \end{bmatrix}$ (d). None of the above

108. If $A = \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}$, then adj. A is: (a). $\begin{bmatrix} -4 & -2 \\ -3 & -1 \end{bmatrix}$ (b). $\begin{bmatrix} 4 & 2 \\ 3 & 1 \end{bmatrix}$ (c). $\begin{bmatrix} -4 & -2 \\ -3 & 1 \end{bmatrix}$ (d). $\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$

109. If $B = \begin{bmatrix} 2 & -3 \\ 1 & 6 \end{bmatrix}$, then transpose of B is: (a). $\begin{bmatrix} 2 & 1 \\ 3 & 6 \end{bmatrix}$ (b). $\begin{bmatrix} 2 & 1 \\ -3 & 6 \end{bmatrix}$ (c). $\begin{bmatrix} 2 & -3 \\ 1 & 6 \end{bmatrix}$ (d). $\begin{bmatrix} 2 & 3 \\ 1 & -6 \end{bmatrix}$

110. If $A = \begin{bmatrix} 4 & 5 \\ -2 & 3 \end{bmatrix}$, then $(A^T)^T$ is: (a). $\begin{bmatrix} 4 & -2 \\ 5 & 3 \end{bmatrix}$ (b). $\begin{bmatrix} 4 & 5 \\ -2 & 3 \end{bmatrix}$ (c). $\begin{bmatrix} 4 & 5 \\ 2 & 3 \end{bmatrix}$ (d). None of the above

111. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, then A^{-1} is: (a). $\left(\frac{1}{-19}\right)A$ (b). A (c). $\left(\frac{1}{-19}\right)$ (d). -A

112. If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, then A^3 is: (a). I_2 (b). I_4 (c). I_3 (d). None of the above

113. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then, adj (adj(A)) gives: (a). –A (b). adj. (A) (c). A (d). (1/2)A

114. If $A = \begin{bmatrix} 3 & -6 \\ 1 & -4 \end{bmatrix}$, then $|A|$ = (a). -12 (b). 12 (c). 0 (d). None of the above

SHORT QUESTIONS ANSWER

1. A (n) ____________ is an arrangement of number in rows and columns.
2. The individual quantities like a_{11}, a_{22}, a_{13}.....a_{mn} are called the _____ of the matrix.
3. If there are m rows and n columns in the matrix then order of matrix is________
4. If we interchange rows and columns of a matrix A, the new matrix obtained is known as the ________ of matrix A and it is denoted by _______
5. A matrix in which there is only one row and any number of columns is said to be _______ matrix.
6. A matrix in which there is only one column and any number of rows is said to be ______ matrix.
7. If all the elements of matrix are zero is known as _____ matrix.
8. A matrix in which number of rows and number of columns are _______ is said to be a square matrix.
9, If the transpose of a square matrix gives the same matrix is known as______ matrix.
10. Each diagonal elements of a skew symmetric matrix must be ______
11. A square matrix in which all diagonal elements are _______ and all other elements are ______ is known as an identity matrix.
12. If all elements except diagonal elements of a square matrix are zero the matrix is said to be__________ matrix.
13. The addition or subtraction of two or more matrices is possible only when they are of the______
14. If A is a matrix of order m x n and B is a matrix of order n x p. then product AB will be a matrix of order ____________.
15. In ________ the number of rows and columns are equal.
16. In ______ the number of rows and columns are not necessarily equal.
17. A determinant has _______
18. A matrix cannot have ________
19. The _________ of any element of a matrix can be obtained by eliminating the row and column in which that element lies.
20._______ of a square matrix is the transpose of the matrix of the co-factors of a given matrix.

True-False

1. If A be a matrix of order of 3 x 2, then there are 3 columns and 2 rows in the matrix A.
2. A matrix is an arrangement of numbers in rows and columns.
3. The matrix is denoted by small letters like a, b, c etc.
4. The element of i^{th} row and j^{th} column is denoted by a_{ij}.
5. Two matrices are said to be equal only if the number of rows in both matrices should be equal.
6. A matrix in which there is only one column and any number of rows is said to be a row matrix.
7. A matrix in which there is only one column and any number of rows is said to be a column matrix.

8. A zero matrix can be a row matrix or a column matrix.

9. Each diagonal element of a skew symmetric matrix must be zero.

10. In a skew symmetric matrix diagonal elements are non-zero.

11. If all elements except diagonal elements of a square matrix are zero the matrix is said to be a diagonal matrix.

12. The addition or subtraction of two or more matrices is possible only when they are of the same order.

13. The scalar product of a matrix is obtained by multiplying each element of first row of the matrix by that scalar.

14. For the multiplication of two matrices A and B, the number of columns of matrix A and the number of rows of matrix B should not be equal.

15. The matrix multiplication is commutative.

16. If A and B any two matrices of any order m x n, then A + B = B + A.

17. If A, B, c be any three matrices of the same order m x n, then A + C B + C gives A=B.

18. Ad joint of a square matrix is the transpose of the matrix of the co-factors of a given matrix.

19. In Equal matrices, the order of both matrices is not necessarily in the same order.

20. In determinant the number of rows and columns are equal.

21. In matrix the number of rows and columns are not necessarily equal.