BBA- COMPLIMENTARY III-MATHEMATICS FOR MANAGEMENT

For BBA Off campus stream

1. Addition of vectors is given by the rule
(A) **$(a_1, b_1) + (a_2, b_2) = (a_1 + a_2, b_1 + b_2)$**
(B) $(a_1, b_1) + (a_2, b_2) = (a_1 + b_1, a_2 + b_2)$
(C) $(a_1, b_1) + (a_2, b_2) = (a_1 + b_2, b_1 + a_2)$
(D) $(a_1, b_1) + (a_2, b_2) = (a_1 + a_2 + b_1 + b_2)$

2. If V is said to form a vector space over F for all x, y ∈ V and _, _ ∈ F, which of the equation is correct:
(A) (_ + _) x = _x . _x
(B) **_ (x + y) = _x + _y**
(C) (_ + _) x = _x ∪ _x
(D) (_ + _) x = _x _ _x

3. In any vector space V (F), which of the following results is correct?
(A) 0 . x = x
(B) _ . 0 = _
(C) **(–_)x = –(_x) = _(– x)**
(D) None of the above

4. If _, _ ∈F and x, y ∈ W, a non empty subset W of a vector space V(F) is a subspace of
V if –
(A) **_x + _y ∈ W**
(B) _x - _y ∈ W
(C) _x . _y ∈ W
(D) _x / _y ∈ W

5. If L, M, N are three subspaces of a vector space V, such that M ⊆ L then
(A) L _ (M + N) = (L _ M) . (L _ N)
(B) L _ (M + N) = (L + M) _ (L + N)
(C) **L _ (M + N) = (L _ M) + (L _ N)**
(D) L _ (M + N) = (L _ M _ N)

6. Under a homomorphism T : V _ U, which of the following is true?
(A) T(0) = 1
(B) **T(– x) = – T(x)**
(C) T(0) = _
(D) None of the above

7. If A and B are two subspaces of a vector space V(F), then
(**A)**
(B)

(C) A + B = A _ B
(D) Both (A) and (B)

8. If V = R_4(R) and S = {(2, 0, 0, 1), (– 1, 0, 1, 0)}, then L(S)
(A) {(2_ + _, 0, _, _) | _, _ ∈ R}
(B) {(2__+_, 0, _, _) | _, _ ∈ R}
(C) {(2__ – _, 0, _, _) | _, _ ∈ R}
(D) **{(2_ – _, 0, _, _) | _, _ ∈ R}**

9. If V is said to form a *vector space* over F for all x, y ∈ V and _, _ ∈ F, which of the equation is correct:
(A) **(__) *x* = _ (_*x*)**
(B) (_ + _) x = _x . _x
(C) (_ + _) x = _x ∪ _x
(D) (_ + _) x = _x _ _x

10. If V is an inner product space, then
(A) **(0, v) = 0 for all v ∈ V**
(B) (0, v) = 1 for all v ∈ V
(C) (0, v) = _ for all v ∈ V
(D) None of the above

11. If V be an inner product space, then
(A) || x - y || _ || x || + || y || for all x, y ∈ V
(B) || **x + y || _ || x || + || y || for all x, y ∈ V**
(C) || x + y || _ || x || + || y || for all x, y ∈ V
(D) || x - y || _ || x || + || y || for all x, y ∈ V

12. If V be an inner product space, then
(A) || x + y ||$_2$ + || x – y ||$_2$ = 2 (|| x ||$_2$ - || y ||$_2$)
(B) || x + y ||$_2$ + || x – y ||$_2$ = 2 (|| x || + || y ||)$_2$
(C) **|| x + y ||$_2$ + || x – y ||$_2$ = 2 (|| x ||$_2$ + || y ||$_2$)**
(D) || x + y ||$_2$ + || x – y ||$_2$ = 2 (|| x + y ||)$_2$

13. In Cauchy-Schwarz inequality, the absolute value of cosine of an angle is at most
(A) **1**
(B) 2
(C) 3
(D) 4

14. If A and B are two subspaces of a FDVS V then, dim (A + B) is equal to
(A) dim A + dim B + dim (A _ B)
(B) dim A – dim B – dim (A _ B)
(C) dim A + dim B – (dim A _ dim B)
(D) **dim A + dim B – dim (A _ B)**

15. If A and B are two subspaces of a FDVS V and A _ B = (0) then
(A) dim (A + B) = dim A ∪ dim B
(B) **dim (A + B) = dim A + dim B**
(C) dim (A + B) = dim A _ dim B
(D) dim (A + B) = dim (A + B)

16. If V be an inner product space and x, y ∈ V such that x ⊥ y, then
(A) **$|| x + y ||_2 = || x ||_2 + || y ||_2$**
(B) $|| x + y ||_2 = || x ||_2 . || y ||_2$
(C) $|| x + y ||_2 = || x ||_2 \cup || y ||_2$
(D) $|| x + y ||_2 = || x ||_2$ _ $|| y ||_2$

17. If V be a finite dimensional space and $W_1,..., W_m$ be subspaces of V such that, V = W_1 +
... + W_m and dim V = dim W_1 + ... + dim W_m, then
(A) V = 0
(B) V = dim$W_1 \oplus ... \oplus W_m$
(C) V = _
(D) **$V = W_1 \oplus W_2 + ... + \oplus W_m$**

18. If V is a finite dimensional inner product space and W is a subspace of V, then
(A) $V = W . W_\perp$
(B) $V = W + W_\perp$
(C) **$V = W \oplus W_\perp$**
(D) V = W _ $W_\perp$

19. If W is a subspace of a finite dimensional inner product space V, then
(A) **$(W_\perp)_\perp = W$**
(B) $(W_\perp)_\perp$ _ W
(C) $(W_\perp)_\perp$ _ W
(D) $(W_\perp)_\perp$ _ W

20. If W_1 and W_2 be two subspaces of a vector space V(F) then
(A) **$W_1 + W_2 = \{w_1 + w_2 \mid w_1 \in W_1, w_2 \in W_2\}$**
(B) $W_1 + W_2 = \{w_1 . w_2 \mid w_1 \in W_1, w_2 \in W_2\}$
(C) $W_1 + W_2 = \{w_1$ _ $w_2 \mid w_1 \in W_1, w_2 \in W_2\}$
(D) $W_1 + W_2 = \{w_1 \cup w_2 \mid w_1 \in W_1, w_2 \in W_2\}$

21. If {w1,..., wm} is an ortho normal set in V, then for all v ∈ V is
(A) Greater than or equal to $|| v ||_2$
(B) **Less than or equal to $|| v ||_2$**
(C) Greater than $|| v ||_2$
(D) Less than $|| v ||_2$

22. If W is a subspace of V and v ∈ V satisfies (v, w) + (w, v) _ (w, w) for all w ∈ W

where V is an inner product, then
(A) (v, w) = _
(B) (v, w) = 1
(C) (v, w) = 2
(D) **(v, w) = 0**

23. If S_1 and S_2 are subsets of V, then:
(A) **$L(L(S_1)) = L(S_1)$**
(B) $L(L(S_1)) = L(S_2)$
(C) $L(L(S_1)) = L(V)$
(D) $L(L(S_1)) = L(S_1.S_2)$

24. If V be an inner product space and two vectors *u*, *v* ∈ V are said to be orthogonal if
(A) (u, v) = 1 ⇔ (v, u) = 1
(B) (u, v) _ 0 ⇔ (v, u) _ 0
(C) **(u, v) = 0 ⇔ (v, u) = 0**
(D) (u, v) = _ ⇔ (v, u) =
_
25. A set $\{u_i\}_i$ of vectors in an inner product space V is said to be orthogonal if
(A) **$(u_i, u_j) = 0$ for i _ j**
(B) $(u_i, u_j) = 1$ for i _ j
(C) $(u_i, u_j) =$ _ for i _ j
(D) $(u_i, u_j) = 2$ for i _ j

26. If V and U be two vector spaces over the same field F where x, y ∈ V; _, _ ∈ F, then a
mapping T : V _ U is called a homomorphism or a linear transformation if
(A) T(_x + _y) = _T(x) . _T(y)
(B) **T(_x + _y) = _T(x) + _T(y)**
(C) T(_x + _y) = _T(x) - _T(y)
(D) T(_x + _y) = _T(y) + _T(x)

27. In any vector space V (F), which of the following results is correct?
(A) 0 . x = 0
(B) _ . 0 = 0
(C) (_ – _)x = _x – _x, _, _∈ F, x ∈ V
(D) **All of the above**

28. If V is said to form a vector space over F for all x, y ∈ V and _, _ ∈ F, which of the equation is correct:
(A) **(_ + _) x = _x + _x**
(B) (_ + _) x = _x . _x
(C) (_ + _) x = _x ∪ _x
(D) (_ + _) x = _x _ _x

29. The sum of two continuous functions is ________________.
(A) Non continuous
(B) **Continuous**
(C) Both continuous and non continuous
(D) None of the above

30. A non empty subset W of a vector space V(F) is said to form a subspace of ___ if W forms a vector space under the operations of V.
(A) **V**
(B) F
(C) W
(D) None of the above

31. If S_1 and S_2 are subsets of V, then:
(A) **$L(S_1 \cup S_2) = L(S_1) + L(S_2)$**
(B) $L(S_1 \cup S_2) = L(S_1) . L(S_2)$
(C) $L(S_1 \cup S_2) = L(S_1) \oplus L(S_2)$
(D) $L(S_1 \cup S_2) = L(S_1)$ _ $L(S_2)$

32. To be a subspace for a non empty subset W of a vector space V (F), the necessary and
sufficient condition is that W is closed under __________________.
(A) Subtraction and scalar multiplication
(B) Addition and scalar division
(C**) Addition and scalar multiplication**
(D) Subtraction and scalar division

33. If $V = F_2$
$_2$, where $F_2 = \{0, 1\}$ mod 2 and if $W_1 = \{(0, 0), (1, 0)\}$,$W_2 = \{(0, 0), (0, 1)\}$,W_3
$= \{(0, 0), (1, 1)\}$ then $W_1 \cup W_2 \cup W_3$ is equal to
(A) **{(0, 0), (1, 0), (0, 1), (1, 1)}**
(B) {(1, 0), (1, 0), (1, 1), (1, 1)}
(C) {(0, 1), (1, 1), (0, 1), (1, 1)}
(D) {(0, 0), (1, 1), (1, 1), (1, 0)}

34. If the space V (F) = F_2 (F) where F is a field and if $W_1 = \{(a, 0) \mid a \in F\}$, $W_2 = \{(0, b)$
|
$b \in F\}$then V is equal to
(A) $W_1 + W_2$
(B**) $W_1 \oplus W_2$**
(C) $W_1 . W_2$
(D) None of the above

35. If V be the vector space of all functions from **R** _ **R** and $V_e = \{f \in V \mid f \text{ is even}\}$, $V_o =$
$\{f \in V \mid f \text{ is odd}\}$. Then V_e and V_o are subspaces of V and V is equal to

(A) $V_e . \; V_o$
(B) $V_e + V_o$
(C) $V_e \cup V_o$
(D) **$V_e \oplus V_o$**

36. L(S) is the smallest subspace of V, containing _________.
(A) V
(B) **S**
(C) 0
(D) None of the above

37. If S_1 and S_2 are subsets of V, then
(A) **$S_1 \subseteq S_2 \Rightarrow L(S_1) \subseteq L(S_2)$**
(B) $S_1 \subseteq S_2 \Rightarrow L(S_1)$ _ $L(S_2)$
(C) $S_1 \subseteq S_2 \Rightarrow L(S_1) \cup L(S_2)$
(D) $S_1 \subseteq S_2 \Rightarrow L(S_1) \oplus L(S_2)$

38. If W is a subspace of V, then which of the following is correct?
(A) **L(W) = W**
(B) $L(W) = W_3$
(C) $L(W) = W_2$
(D) $L(W) = W_4$

39. If S = {(1, 4), (0, 3)} be a subset of R2(R), then
(A) $(2, 1) \in L(S)$
(B) $(2, 0) \in L(S)$
(C) **$(2, 3) \in L(S)$**
(D) $(3, 4) \in L(S)$

40. If V = R4(R) and S = {(2, 0, 0, 1), (– 1, 0, 1, 0)}, then
(A) L(S) = {(2_ + _, 0, _, _) | _, _ ∈ R}
(B) L(S) = {(2_ ⊕ _, 0, _, _) | _, _ ∈ R}
(C) L(S) = {(2__, 0, _, _) | _, _ ∈ R}
(D) **L(S) = {(2_ – _, 0, _, _) | _, _ ∈ R}**

41. In dot or scalar product of two vectors which of the following is correct?
(**A)**
(B) = 0
(C) = 1
(D) None of the above
Ans: (A)

42. If are vectors and _, _ real numbers, then which of the following is correct?
(**A)**
(B) = __

(C) = 1
(D) = 0
Ans: (A)

43. If V is an inner product space, then
(A) (u, v) = 1 for all v ∈ V ⇒ $u = 0$
(B) **(u, v) = 0 for all v ∈ V ⇒ $u = 0$**
(C) (u, v) = _ for all v ∈ V ⇒ $u = 0$
(D) None of the above

44. If V be an inner product space and v ∈ V, then norm of v (or length of v) is denoted by
(A) **|| v ||**
(B)
(C) |v|
(D) None of the above

45. If V be an inner product space, then for all u, v ∈ V
(A) | (u, v) | = || u || || v ||
(B) | (u, v) | _ || u || || v ||
(C) **| (u, v) | _ || u || || v ||**
(D) | (u, v) | _ || u || || v ||

46. If two vectors are L.D. then one of them is a scalar ______ of the other.
(A) Union
(B) Subtraction
(C) Addition
(D) **Multiple**

47. If v_1, v_2, v_3 ∈ V(F) such that v_1 + v2 + v_3 = 0 then which of the following is correct?
(A) L({v_1, v_2}) = L({v_1, v_3})
(B) L({v_1, v_2}) = L({v_2, v_2})
(C) **L({v_1, v_2}) = L({v_2, v_3})**
(D) L({v_1, v_2}) = L({v_1, v_1})

48. The set S = {(1, 2, 1), (2, 1, 0), (1, – 1, 2)} forms a basis of
(A) **R_3**
(R)
(B) R_2
(R)
(C) R (R)
(D) None of the above

49. If V is a FDVS and S and T are two finite subsets of V such that S spans V and T is L.I.
then

(A) 0 (T) = 0 (S)
(B) **0 (T) _ 0 (S)**
(C) 0 (T) _ 0 (S)
(D) None of the above

50. If dim V = n and S = {v1, v2,...,vn} is L.I. subset of V then
(A) V ⊇ L(S)
(B**) V ⊆ L(S)**
(C) V ⊂ L(S)
(D) V ⊃ L(S)

51. Which of the following equation is correct in terms of linear transformation where T : V
_ W and x, y ∈ V, _, _ ∈ F and V and where W are vector spaces over the field F.
(A) **T(_x +_y) = _T(x) + _T(y)**
(B) T(_x +_y) = _T(x) + _T(y)
(C) T(_x +_y) = _T(y) + _T(x)
(D) T(_x +_y) = _T(x) . _T(y)

52. If T : V _ W be a L.T, then which of the following is correct
(A) Rank of T = w(T)
(B) Rank of T = v(T)
(C) **Rank of T = r(T)**
(D) None of the above

53. If T, T_1, T_2 be linear operators on V, and I : V _ V be the identity map I(v) = v for all v (which is clearly a L.T.) then
(A) **_(T_1T_2) = (_T_1)T_2 = T_1(_T_2) where _ ∈ F**
(B) _(T_1T_2) = _T_2 = _T_1 where _ ∈ F
(C) _(T_1T_2) = _T_1 = (_T_2) where _ ∈ F
(D) _(T_1T_2) = _(T_1+T_2) = T_2(_T_1) where _ ∈ F

54. If T, T_1, T_2 be linear operators on V, and I : V _ V be the identity map I(v) = v for all v (which is clearly a L.T.) then
(A) $T_1(T_2T_3) = (T_1T_3)T_2$
(B) $T_1(T_2T_3) = (T_2T_3)T_1$
(C) **$T_1(T_2T_3) = (T_1T_2)T_3$**
(D) $T_1(T_2T_3) = (T_1T_2)$

55. If T : V _ W be a L.T, then which of the following is correct
(A) Nullity of T= w(T)
(B**) Nullity of T = v(T)**
(C) Nullity of T = r(T)

(D) None of the above

56. If T : V _ W be a L.T, then which of the following is correct
(A**) Rank T + Nullity T = dim V**
(B) Rank T . Nullity T = dim V
(C) Rank T - Nullity T = dim V
(D) Rank T / Nullity T = dim V

57. If T : V _ W be a L.T, then which of the following is correct
(A) Range T ∩ Ker T = {1}
(B) Range T ∩ Ker T = {2}
(C) Range T ∩ Ker T = {3}
(D**) Range T ∩ Ker T = {0}**

58. If T : V _ W be a L.T and if T(T(v)) = 0, then
(A) T(v) = 1, v ∈ V
(B) T(v) = _, v ∈ V
(C) T(v) = 2, v ∈ V
(D) **T(v) = 0, v ∈ V**

59. If V and W be two vector spaces over the same field F and T : V
→
W and S : V
→
W be
two linear transformations then
(A) **(T + S)v = T(v) + S(v), v ∈ V**
(B) (T + S) v = T(v) . S(v), v ∈ V
(C) (T + S)v = T(v) ⊕ S(v), v ∈ V
(D) None of the above

60. If V, W, Z be three vector spaces over a field F and T : V _ W, S : W _ Z be L.T then we can define ST : V _ Z as
(A) (ST)v = ((ST)v)
(B) (**ST)v = S(T(v))**
(C) (ST)v = ((ST)v)
(D) (ST)v = (S(Tv))

61. If T, T_1, T_2 be linear operators on V, and I : V _ V be the identity map I(v) = v for all v (which is clearly a L.T.) then
(A) IT = T_1
(B) IT = T_2
(C) IT = V
(D) **IT = T**

62. If T, T_1, T_2 be linear operators on V, and I : V _ V be the identity map I(v) = v for all v (which is clearly a L.T.) then
(A**) $T(T_1 + T_2) = TT_1 + TT_2$**
(B) $T(T_1 + T_2) = T_1 + T_2$
(C) $T(T_1 + T_2) = T(TT_1 + TT_2)$
(D) $T(T_1 + T_2) = TT_1T_2$

63. If V and W be two vector spaces (over F) of dim m and n respectively, then
(A) **dim Hom (V, W) = mn**
(B) dim Hom (V, W) = m+n
(C) dim Hom (V, W) = m⊕n
(D) None of the above

64. If T, T_1, T_2 be linear transformations from V _ W, S, S_1, S_2 from W _ U and K, K_1, K_2 from U _ Z where V, W, U, Z are vector spaces over a field F then
(A) K(ST) = KST
(B) **K(ST) = (KS)T**
(C) K(ST) = KS
(D) K(ST) = ST

65. If T_1, T_2
∈
Hom (V, W) then
(A) **$r(\_T_1) = r(T_1)$ for all _ ∈ F, _ _ 0**
(B) $r(\_T_1)$ = r_ for all _ ∈ F, _ _ 0
(C) $r(\_T_1) = T_1$ for all _ ∈ F, _ _ 0
(D) None of the above

66. If T_1, T_2
∈
Hom (V, W) and r(T) means rank of T then
(A) $| r(T_1) – r(T_2) | = r(T_1 + T_2) = r(T_1) + r(T_2)$
(B) $| r(T_1) – r(T_2) | \geq r(T_1 + T_2) \geq r(T_1) + r(T_2)$
(C) **$| r(T1) – r(T_2) |$ _ $r(T_1 + T_2)$ _ $r(T_1) + r(T_2)$**
(D) $| r(T_1) – r(T_2) | < r(T_1 + T_2) < r(T_1) + r(T_2)$

67. Let T : V _ W and S : W _ U be two linear transformations. Then
(A) $(ST)_{-1} = T_{-1} T_{-1}$
(B) $(ST)_{-1} = T_{-1}T$
(C) **$(ST)_{-1} = T_{-1} S_{-1}$**
(D) None of the above

68. T be a linear operator on V and let Rank T_2 = Rank T then
(A**) Range T ∩ Ker T = {0}**
(B) Range T ∩ Ker T = {1}
(C) Range T ∩ Ker T = {2}

(D) Range T ∩ Ker T = {3}

69. A L.T. T : V _ W is called non-singular if
(A) Ker T = _
(B) **Ker T = {0}**
(C) Ker T = {1}
(D) Ker T = {2}

70. If T be a linear operator on R_3, defined by T(x1, x2, x3) = (3x1, x1– x2, 2x1 + x2 + x3)
and (z1, z2, z3) be any element of R_3 then
(A) T_{-1} (z1, z2, z3) = 0
(B) T_{-1} (z1, z2, z3) = _
(C) T_{-1} (z1, z2, z3) = 1
(**D)**

71. If T : V _ V is a L.T., such that T is not onto, and that there exists some 0 _ v in V such
that, T(v) = 0, then
(A**) Ker T = {0**}
(B) Ker T = _
(C) Ker T = {1}
(D) None of the above

72. If T : V _ W and S : W _ U be two linear transformations and if ST is one-one onto then
(A) $(ST)_{-1} = 0$
(B) **$(ST)_{-1} = T_{-1} S_{-1}$**
(C) $(ST)_{-1} = 1$
(D) None of the above

73. If T be a linear operator on FDVS V and suppose there is a linear operator U on V such
that TU = I then
(A) **$T_{-1} = U$**
(B) $T_{-1} = I$
(C) $T_{-1} = V$
(D) None of the above

74. If V_1 and V_2 be vector spaces over F then$V_1 \times V_2$ is FDVS if and only if
(A) V_1 and V_2 are not FDVS
(B) V_1 is FDVS
(C) V_2 is FDVS
(D**) V_1 and V_2 are FDVS**

75. If T, T_1, T_2 be linear transformations from V _ W, S, S_1, S_2 from W _ U and K, K_1, K_2

from U _ Z where V, W, U, Z are vector spaces over a field F then
(A) (_S)T = _(S+T) = S(_+T) where _ $\in$ F
(B) **(_S)T = _(ST) = S(_T) where _ $\in$ F**
(C) (_S)T = _(S-T) = S(_-T) where _ $\in$ F
(D) (_S)T = ST = _T where _ $\in$ F

76. If W_1 and W_2 be subspaces of V such that are FDVS then
(A) **are in FDVS**
(B) are not in FDVS
(C) V(W_1 _ W_2) are in FDVS
(D) None of the above
Ans: (A) are in FDVS

77. If U(F), V(F) be vector spaces of dimension n and m, respectively, then
(A) Hom (U, V) > $M_{m\times n}(F)$
(B) Hom (U, V) = $M_{m\times n}(F)$
(C) **Hom (U, V) $\cong$ $M_{m\times n}(F)$**
(D) Hom (U, V) < $M_{m\times n}(F)$

78. If U(F), V(F) be vector spaces of dimension n and m, respectively, then
(A) **dim Hom (U, V) = mn**
(B) dim Hom (U, V) > mn
(C) dim Hom (U, V) < mn
(D) dim Hom (U, V) $\cong$ mn

79. If S, T be two linear transformations from V (F) into V (F) and β be an ordered basis of
V, then
(A) **[ST]_ = [S]_[T]_**
(B) [ST]_ = [S+T]_
(C) [ST]_ = ST
(D) None of the above

80. If T : V(F) _ V(F) be a linear transformation and _ = {u_1, ..., u_n}, _ = {v_1, ..., v_n} be two
ordered basis of V. Then
∃
a non singular matrix P over F such as
(A) [T]_ = $P^{-1}P$
(B) **[T]_ = P^{-1}[T]_P**
(C) [T]_ = P^{-1}[T]_ + P
(D) [T]_ = P^{-1}[T]_

81. If T be a linear operator on C2 defined by T(x1, x2) = (x1, 0) and β = {$\in$1 = (1, 0), $\in$2

= (0, 1)}, β' = {α 1 = (1, i), α 2 = (–i, 2)} be ordered basis for C2 then
(A)
(B)
(**C)**
(D) None of the above

82. If T be the linear operator on R2 defined by T(x1, x2) = (–x2, x1) and if _ is any ordered
basis for R2 and [T]_ = A, then
(A) $a_{12}a_{21} > 0$, where A = (a_{ij})
(B) **$a_{12}a_{21}$ _ 0, where A = (a_{ij})**
(C) $a_{12}a_{21} < 0$, where A = (a_{ij})
(D) $a_{12}a_{21} = 0$, where A = (a_{ij})

83. Let T be a linear operator on F_n and A be the matrix of T in the standard ordered basis for
F_n. W be the subspace of Fn spanned by the column vectors of A then
(A) **Rank of T = dim W**
(B) Rank of T = dim W + dim T
(C) Rank of T = dim W - dim T
(D) None of the above

84. If V be the space of all polynomial functions from R into R of the form f(x) = $c_o + c_1x$ +
$c_2x_2 + c_2x_3$ and _ = {1, x, x_2, x_3} be an ordered basis of V. If D be the differential operator on V then
(**A)**
(B)
(C)
(D)

85. If T, T_1, T_2 be linear transformations from V _ W, S, S_1, S_2 from W _ U and K, K_1, K_2 from U _ Z where V, W, U, Z are vector spaces over a field F then
(A) $S(T_1 + T_2) = (ST_1)(ST_2)$
(B) $S(T_1 + T_2) = ST_1$
(C) $S(T_1 + T_2) = ST_1 - ST_2$
(D) **$S(T_1 + T_2) = ST_1 + ST_2$**

86. If T, T_1, T_2 be linear transformations from V _ W, S, S_1, S_2 from W _ U and K, K_1, K_2 from U _ Z where V, W, U, Z are vector spaces over a field F then
(A) $(S_1 + S_2)T = S_1S_2$
(B) **$(S_1 + S_2)T = S_1T + S_2T$**
(C) $(S_1 + S_2)T = (S_1 - S_2)T$
(D) $(S_1 + S_2)T = S_1T \cdot S_2T$

87. T : R_3 _ R_2, S : R_2 _ R_2 be linear transformations then
(A) **ST is not invertible**

(B) ST is invertible
(C) ST is zero
(D) None of the above

88. If the L.T. T : $\mathbf{R}_7$ _ $\mathbf{R}_3$ has a four dimensional Kernel, then the range of T has dimension
(A) One
(B) Two
(C) **Three**
(D) Four

89. If T be a L.T. from R_7 onto a 3-dimensional subspace of R_5 then
(A) dim Ker T = 1
(B) dim Ker T = 2
(C) dim Ker T = 3
(D) **dim Ker T = 4**

90. Let T : V _ W and S : W _ U be two linear transformations. Then ST is one-one onto if
(A) **S and T are one-one onto**
(B) S and T is onto
(C) Both (A) and (B)
(D) None of the above

91. Let V be a two dimensional vector spacer over the field *F* and _ be an ordered basis for *V*.
If T is a linear operator on V and then
(A) **T_2 – (a + b)T + (ad – bc)I = 0**
(B) T_2 – (a + b)T + (ad – bc)I = 1
(C) T_2 – (a + b)T + (ad – bc)I =2
(D) T_2 – (a + b)T + (ad – bc)I = 3

92. If A be n × n matrix over F, then A is invertible if and only if
(A) Rows of A are linearly dependent over F
(B) Columns of A are linearly dependent over F
(C**) Columns of A are linearly independent over F**
(D) None of the above

93. If be a 2 × 2 matrix over F, then A is invertible if and only
(A) {(a, b), (c, d)} is a basis of F
(B) **{(a, b), (c, d)} is a basis of F_2**
(C) {(a, b), (c, d)} is a basis of F_3
(D) None of the above

94. If dim V = 2 and T be a linear operator on V. Suppose matrix of T with respect to all bases of V is same then

(A) T = _V for some _ ∈F
(B) T = _T for some _ ∈F
(C) **T = _I for some _ ∈F**
(D) None of the above

95. If T be a linear operator on C_2 defined by $T(x_1, x_2) = (x_1, 0)$ and _ = {$\in_1$ = (1, 0), $\in_2$ = (0, 1)}, _ = {_1 = (1, i), $\_{2}$ = (–i, 2)} be ordered basis for C_2 then the matrix of T relative
to the pair _, _ is
(A)
(B)
(C)
(D)
Ans: (A)

96. Let T : V _ W and S : W _ U be two linear transformations. Then T is one-one if
(A) **ST is one-one**
(B) ST is onto
(C) Both (A) and (B)
(D) None of the above

97. Let T : V _ W and S : W _ U be two linear transformations. Then S is onto if
(A) ST is one-one
(B**) ST is onto**
(C) Both (A) and (B)
(D) None of the above

98. If T be a linear operator on R_3, defined by $T(x_1, x_2, x_3) = (3x_1, x_1 - x_2, 2x_1 + x_2 + x_3)$ and if
(z_1, z_2, z_3) be any element of R3 then
(A)
(B)
(C)
(D)

99. If T : V _ W be a L.T. where V and W are two FDVS with same dimension, then which
of the following is correct?
(A) T is invertible.
(B) T is non singular
(C) T is onto
(D) All of the above

100. A L.T. T : V _ V is one-one iff T is
(A) **Onto**
(B) Not onto

(C) Both (A) and (B)
(D) None of the above

101. then a_{33} is
(A) 3
(B) **9**
(C) 2
(D) 6

102. A row matrix is one which has
(A) **One row**
(B) One column
(C) One row and the element of row is zero
(D) One column and the element of column is zero

103. A matrix in which the number of rows is equal to the number of columns is called a
(A) Row Matrix
(B) Column Matrix
(C) Zero Matrix
(D) **Square Matrix**

104. is an example of
(A) Zero Matrix
(B) Column Matrix
(C) Scalar Matrix
(D) **Diagonal Matrix**

105. is an example of
(A) Zero Matrix
(B) Column Matrix
(C) **Scalar Matrix**
(D) Diagonal Matrix

106. A diagonal matrix whose diagonal elements are all equal to 1 (unity) is called
(A) **Identity Matrix**
(B) Diagonal Matrix
(C) Triangular Matrix
(D) None of the above

107. A diagonal matrix whose diagonal elements are equal, is called
(A) **Scalar Matrix**
(B) Identity Matrix
(C) Triangular Matrix
(D) Unit Matrix

108. is an example of

(A) Identity Matrix
(B) **Diagonal Matrix**
(C) Triangular Matrix
(D) None of the above

109. A square matrix (aij), whose elements aij = 0 when i < j is called
(A) a upper triangular matrix
(B) a triangular matrix
(C) **a lower triangular matrix**
(D) None of the above

110. is an example of
(A) **a upper triangular matrix**
(B) a triangular matrix
(C) a lower triangular matrix
(D) None of the above

111. Two matrices A and B are said to be equal if
(A) A and B are of same order
(B) Corresponding elements in A and B are same
(C) **Both (A) and (B)**
(D) None of the above

112. Which of the following matrix are equal
(A)
(**B)**
(C)
(D) All of the above

113. If A and B are two matrices such as , then A + B
is
(**A)**
(B)
(C)
(D) None of the above

114. If A and B be two matrices then which of the following is correct?
(A) A + B = B – A
(B) A + B = AB
(C) **A + B = B + A**
(D) None of the above

115. If A and B be two matrices then which of the following is correct?
(A) A + (B + C) = A . (B + C)
(B) **A + (B + C) = (A + B) + C**
(C) A + (B + C) = AB + BC + CA

(D) A + (B + C) = A + (BC + CA)

116. If and then AB is
(A)
(**B)**
(C)
(D)

117. If then A(BC) is
(A)
(B)
(C)
(D)

118. If A and B be two matrices then which of the following is correct?
(A) A(B + C) = BC + AC
(B) A(B + C) = AC + BC
(C) **A(B + C) = AB + AC**
(D) A(B + C) = BC + AB

119. If A and B be two matrices then which of the following is correct?
(A) (A + B)C = AB + BC
(B) **(A + B)C = AC + BC**
(C) (A + B)C = AB + AC
(D) (A + B)C = AB + AC

120. If A is square matrix such as the A_2 is
(A)
(B)
(C)
(D)

121. If and k = 2 then kA is
(A)
(B)
(C)
(**D)**

122. If k is any complex number and A is matrix then
(A) **k(A + B) = kA + kB**
(B) k(A + B) = A + B
(C) k(A + B) = kAB
(D) None of the above

123. If k is any complex number and A is matrix then
(A) $(k_1k_2)A = A$

(B) $(k_1k_2)A = k_1k_2$
(C**) $(k_1k_2)A = k_1(k_2A)$**
(D) $(k_1k_2)A = (k_1+k_2)A$

124. If and $k_1 = i$, $k_2 = 2$, then
(A) $(k_1 + k_2) A = k_1A . k_2A$
(B) **$(k_1 + k_2) A = k_1A + k_2A$**
(C) $(k_1 + k_2) A = k_1A$
(D) $(k_1 + k_2) A = k_2A$

125. If then the value of 2A + 3B is
(A)
(B)
(C)
(D)

126. If and I is unit matrix of order 2 then $A^2 + 3A + 5I$ is
(A)
(B)
(C)
(**D)**

127. If then AB is equal to
(A)
(B)
(C)
(D)

128. If A_1, A_2, A_3, B_1, B_2 and B_3 are row matrix such as A_1 = (3 4 5 6 0), A_2 = (3 4 5 0 0), A_3
= (3 4 5 0 0), B_1 = (3 4 5 0 2), B_2 = (3 4 5 0 2), B_3 = (3 4 5 0 2) then $(A_1 + A_2 + A_3) + (B_1 + B_2 + B_3)$ is
(A) **(18 24 30 6 6)**
(B) (24 24 30 6 6)
(C) (18 24 34 6 6)
(D) (18 24 30 18 6)

129. If then 5A is equal to
(A)
(B)
(C)
(D)

130. If matrix represents the results of the examination of B. Com. Class
where the rows represent the three sections of the class and the first three columns
represent the number of students securing 1st, 2nd, 3rd divisions respectively in that

order and fourth column represents the number of students who failed in the examination.
Then the number of students passed in three sections respectively are
(A) **6, 18, 30**
(B) 18, 6, 30
(C) 30, 6, 18
(D) 18, 30, 6

131. If matrix represents the results of the examination of B. Com. Class where the rows represent the three sections of the class and the first three columns represent the number of students securing 1st, 2nd, 3rd divisions respectively in that order and fourth column represents the number of students who failed in the examination.
Then the no of students failed in three sections respectively are
(A) 12, 8, 4
(B) 12, 8, 4
(C) **4, 8, 12**
(D) 8, 4, 12

132. If then is
(A)
(B)
(C)
(D)

133. If $a_{ij} = a_{ji}$ for all i and j in a square matrix $A = [a_{ij}]$ then it is called
(A) **Symmetric Matrix**
(B) Skew-Symmetric Matrix
(C) Scalar Matrix
(D) Identity Matrix

134. If $a_{ij} = - a_{ji}$ for all i and j in a square matrix $A = [a_{ij}]$ then it is called
(A) Symmetric Matrix
(B) **Skew-Symmetric Matrix**
(C) Scalar Matrix
(D) Identity Matrix

135. A square matrix $A = [a_{ij}]_{n\times n}$ is said to be Hermitian if
(A) $a_{ij} = - a_{ji}$
(B)
(C)
(D) $a_{ij} = a_{ji}$

136. A square matrix A is said to be orthogonal if
(A) **A A = I**.
(B) A A = 1.

(C) A A = 0.
(D) None of the above.

137. Every square matrix can be uniquely expressed as the sum of
(A) Hermitian and Skew- Hermitian Matrices
(B) Symmetric and Hermitian Matrices
(C) Hermitian and Skew- Symmetric Matrices
(D) **Symmetric and Skew- Symmetric Matrices**

138. If A and B are Hermitian matrices then
(A) AB + BA is Symmetric and AB – BA is Skew-Hermitian matrix
(B) AB + BA is Skew-Hermitian and AB – BA is Hermitian matrix
(C) AB + BA is Symmetric and AB – BA is Skew- Symmetric matrix
(D) **AB + BA is Hermitian and AB – BA is Skew-Hermitian matrix**

139. If A is an orthogonal matrix then
(A) $|A| = 0$
(B) **$|A| = \pm 1$**
(C) $|A| = |A|^2$
(D) $|A| = 1$

140. If A= then A*A is
(**A)**
(B)
(C)
(D) None of the above

141. If , then is
(A)
(**B)**
(C)
(D)

142. If A and B are both symmetric then AB is also symmetric if and only if
(A) AB = (AB)′
(B) AB =
(C) **AB = BA**
(D) AB =

143. If then is
(A)
(B)
(C)
(D) None of the above

144. If then is
(A)
(B)
(C)
(D) None of the above

145. The inverse of the matrix is
(A)
(**B)**
(C)
(D) None of the above

146. The rank of matrix is
(A) **1**
(B) 2
(C) 3
(D) 4

147. The sum of the squares of the eigenvalues of is
(A) 30
(B) 17
(C) 13
(D) **50**

148. If 3 and 15 are the two eigenvalues of then the value of the determinant
(A) **0**
(B) 1
(C) 2
(D) 3

149. If $P^{-1}AP = D$ where and D is a diagonal matrix whose non-zero elements are the eigenvalues of A then the matrix P is
(A)
(B)
(C)
(D) None of the above

150. If matrix A= then A^4 is
(A)
(B)
(C)
(D)

151. A vertex with degree zero is called
(A) **isolated vertex**
(B) pendant vertex

(C) adjacent vertices
(D) None of the above

152. A pair of vertices that determine an edge is called
(A) isolated vertex
(B) pendant vertex
(C) **adjacent vertices**
(D) None of the above

153. A graph with no self loops and parallel edges is called a
(A) Multigraph
(B) **Simple Graph**
(C) Pseudograph
(D) None of the above

154. A graph with self loops and parallel edges is called
(A) Multigraph
(B) Simple Graph
(C**) Pseudograph**
(D) None of the above

155. If G be a simple graph with n vertices then
(A)
(B)
(C)
(D)

156. If G be a graph with n vertices and e edges. Then
(**A)**
(B)
(C)
(D) None of the above

157. The minimum degrees of G are
(A) (G) = min {d(v)3; v ∈ V(G)}
(B) (G) = min {d(v)2; v ∈ V(G)}
(C) **(G) = min {d(v); v ∈ V(G)}**
(D) None of the above

158. A simple graph in which each pair of distinct vertices is joined by an edge is called
(A) Multigraph
(B) Simple Graph
(C) Pseudograph
(D) Complete Graph

159. In a graph with directed edges the in-degree of a vertex *v* denoted by

(A) $d_+(v)$
(B) $d_-(v)$
(C) d(v)
(D) **None of the above**

160. The out-degree of the following graphs is
(A) 1
(B) **2**
(C) 3
(D) 4

161. A graph H = (V(H), E(H)) is called a subgraph of a graph G = (V(G), E(G)) if
(A) $V(H) \supset V(G)$
(B) $V(H) \supseteq V(G)$
(C) $V(H) \subset V(G)$
(D) **$V(H) \subseteq V(G)$**

162. If in a simple graph, its vertex set V can be partitioned into two disjoint non-empty sets
V1 and V2 such that every edge in the graph connects a vertex in V1 and a vertex in V2,
then the graph is called
(A) Multigraph
(B) Subgraph
(C) **Bipartite Graph**
(D) Complete Bipartite Graph

163. The following graph G and H is
(A) **Isomorphic**
(B) Non-isomorphic
(C) Complete Bipartite Graph
(D) None of the above

164. The following graph G and H is
(A) Isomorphic
(B) **Non-isomorphic**
(C) Complete Bipartite Graph
(D) None of the above

165. A vertex v in a graph ,G where _(G) is the component of G and component is a maximal
connected subgraph of G, is said to be a cut-vertex if
(A) _(G – v) < _(G)
(B) _(G – v) = _(G)
(C) _(G – v) _ _(G)
(D) **_(G – v) > _(G)**

166. An edge e in a graph G is said to be a Cut-edge, if
(A) (**G – e) is disconnected**
(B) (G – e) is connected
(C) (G – e) is continuous
(D) None of the above

167. The following graph contains
(A) No Cut-edge
(B) **One Cut-edge**
(C) Two Cut-edge
(D) Three Cut-edge

168. A directed graph is __________connected if there is a path from u to v and v to u, whenever u and v are vertices
(A) **Strongly**
(B) Weakly
(C) Unilaterally
(D) None of the above

169. A directed graph is __________ connected if there is a path between any two vertices in
the underlying undirected graph
(A) Strongly
(B) **Weakly**
(C) Unilaterally
(D) None of the above

170. A directed graph is said to be __________ connected if in the two vertices u and v, there
exists a directed path either from u to v or from v to u.
(A) Strongly
(B) Weakly
(C) **Unilaterally**
(D) None of the above

171. A subset S of the edge set of a connected graph G is called an edge cutest or cut-set of G
if G – S is
(A) **Disconnected**
(B) Connected
(C) Continuous
(D) None of the above

172. A subset u of the vertex set of G is called a vertex cut-set if G – u is
(A) **Disconnected**

(B) Connected
(C) Continuous
(D) None of the above

173. For every graph G,
(A) K(G) ≥ _ (G)
(B) K(G) = _ (G)
(C) **K(G) _ _ (G)**
(D) None of the above

174. For every graph G,
(A) **K(G) _ (G)**
(B) K(G) ≥ (G)
(C) K(G) = (G)
(D) None of the above

175. The union of two simple graphs G1 = (V1, E1) and G2 = (V2, E2) is the simple graph
with vertex set V1 ∪ V2 and edge set E1 ∪ E2 and is denoted by
(A) **G1 ∪ G2**
(B) G1 ∩ G2
(C) G1 ⊕ G2
(D) None of the above

176. The intersection of two simple graphs G1 = (V1, E1) and G2 = (V2, E2) is the simple
graph with vertex set V1 ∩ V2 and edge set E1 ∩ E2 and is denoted by
(A) G1 ∪ G2
(B) **G1 ∩ G2**
(C) G1 ⊕ G2
(D) None of the above

177. The ring sum of two graphs G1 and G2 is a graph consisting of the vertex set V1 ∪ V2
and of edges that are either in G1 or in G2, but not in both and is denoted by
(A) G1 ∪ G2
(B) G1 ∩ G2
(C) **G1 ⊕ G2**
(D) None of the above

178. The ring sum of two graphs G1 and G2 is a graph consisting of the vertex set V1 ∪ V2
and of edges that are either in G1 or in G2, but not in both and Δ is the symmetric difference then

(A) E1 Δ E2 = (E1 – E2) _ (E2 – E1)
(B) **E1 Δ E2 = (E1 – E2)** ∪ **(E2 – E1)**
(C) E1 Δ E2 = (E1 – E2) ⊂ (E2 – E1)
(D) None of the above

179. Adjacency matrix uses __________
(A) **Arrays**
(B) Linked lists
(C) Both arrays and linked lists
(D) None of the above

180. Adjacency matrix is a
(A) Directed graphs
(B) Undirected graph
(C) **Both (A) and (B)**
(D) None of the above

181. In adjacency matrix, if there is an edge from vertex v_i to v_j in G, then the element a_{ij} in A
is marked as
(A) Zero
(B) **One**
(C) Two
(D) None of the above

182. For a graph with 'n' vertices, an adjacency matrix requires ______ elements to represent
it.
(A) **n_2**
(B) n_3
(C) n
(D) 2n

183. The adjacency matrix describes the relationships between the
(A) Adjacent vertices
(B) **Adjacent nodes**
(C) Distant nodes
(D) Distant vertices

184. An Euler tour is a tour which traverses each edge exactly _______
(A) **Once**
(B) Twice
(C) Thrice
(D) None of the above

185. A connected graph is Eulerian iff it has _____ vertices of odd degree.

(A) One
(B) Two
(C) Three
(D) **No**

186. A connected graph G has an Eulerian trail iff G has exactly _____ odd vertices
(A) One
(B) **Two**
(C) Three
(D) No

187. If D be a connected directed graph. D is Eulerian iff d+ (v) = d – (v), $\forall$ v $\in$ G, then G
is called
(A) **Balanced digraph**
(B) Unbalanced digraph
(C) Eulerian Digraphs
(D) None of the above

188. If G be a n-vertex graph and if G_1 and G_2 are two graphs obtained from G by recursively
joining pairs of non-adjacent vertices whose degree sum is atleast n. Then,
(A) **$G_1 \geq G_2$**
(B) G_1 _ G_2
(C) **$G_1 = G_2$**
(D) None of the above

189. If G be a graph with at least 3 vertices, then G is Hamiltonian if
(A) C(G) =
k_n, (n _ 3)
(B) **C(G)** ≅
k_n, (n _ 3)
(C) C(G) _
k_n, (n _ 3)
(D) None of the above

190. If G be a graph with at least 3 vertices, then G is Hamiltonian for all pairs u and v of nonadjacent
vertices of G iff
(A) **d(u) + d(v) _ n(n _ 3)**
(B) d(u) + d(v) _ n(n _ 3)
(C) d(u) + d(v) = n(n _ 3)
(D) None of the above

191. If G is Hamiltonian then, for every non-empty proper subset S of V, then
(A) w(G – S) = |S|

(B) w(G – S) ≥ |S|
(C) **w(G – S) _ |S|**
(D) None of the above

192. A simple graph is connected if there exists at least ____ spanning tree.
(A) **One**
(B) Two
(C) Three
(D) Four

193. The spanning tree of a connected graph can be made using
(A) Depth-First Search (DFS)
(B) Breadth-First Search (BFS)
(C) **Both (A) and (B)**
(D) None of the above

194. Weight of a tree is the sum of weights of the edges in a tree and is denoted by
(A) wt
(B) **wt(T)**
(C) wt(T_2)
(D) None of the above

195. The optimal spanning tree can be found by
(A) Kruskal's algorithm
(B) Prim's algorithm
(C) Boruvka's algorithm
(D) **All of the above**

196. Weight of the optimal spanning tree of the following graph is
(A) 6
(B) **8**
(C) 10
(D) 12

197. Boruvka's algorithm finds a minimum spanning tree in
(A) **Weighted graph**
(B) Directed graph
(C) Undirected graph
(D) None of the above

198. A vertex with degree zero is
(A) Pendent vertex
(B) Adjacent vertex
(C) **Isolated vertex**
(D) None of the above

199. A vertex with degree one is
(A) **Pendent vertex**
(B) Adjacent vertex
(C) Isolated vertex
(D) None of the above

200. In a graph, if movement from one vertex to another follows a direction, then it is
(A) **Directed graph**
(B) Undirected graph
(C) Complete graph
(D) Pseudo graph