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<u>TDC part – I Mathematics (General and subsidiary) sample paper</u>

<u>Set theory</u>

1. If A and B any two sets then symmetric differences of A and B denoted as A Δ B =
   a. (A – B) U (B – A) b. (A – B) ∩ (B – A) c. A –(B∩ A) d. B –(B∩ A)
2. If A and B are any two sets , then (A U B)'=
   a. A'U B' b. A' ∩ B' c. A' ∩ B d. A ∩ B'
3. If A and B are any two sets , then (A U B)' =
   a. A' U B b. A U B' c. A' U B' d. A' ∩ B'
4. If A = { 1 , 3, 5, …………,2n-1 , …… } and B = { 2, 4 , 6 ….. 2n …..} then A Δ B =
   a. A ∩ B b. A' ∩ B c. A ∩ B' d. A U B
5. For any three sets A , B and C , A –(B ∩ C) =
   a. (A –B) U C b. (A –B) ∩ C c. (A –B) ∩ (A –C) d. (A –B)U(A –c)
6. For any three sets A , B and C , A –(B U C) =
   b. (A –B) U C b. (A –B) ∩ C c. (A –B)U(A –C) d. None of these
7. If X and Y are any two sets then (X –Y) U (X ∩ Y) =
   a. X b. Y c. X U Y d. None of these
8. If X and Y are any two sets then (Y –X) U (Y ∩ X) =
   b. X b. Y c. X U Y d. None of these
9. For any two sets X and Y , X –Y =
   a. X^c –Y b. X^c –Y^c c. Y^c –X^c d. None of these
10. Power set of empty set ∅ is
    a. 1 b. ∅ c. { ∅ } d. 0
11. If X , Y and Z are any three sets then (X –Y) –Z =
    a. X ∩ (Y ∩ Z^c) b. X ∩ (Y^c ∩ Z) c. X ∩ (Y^C ∩ Z^c) d. None of these
12. For any two sets X and Y , (X U Y) ∩ (X U Y^c) =
    a. X b. Y c. X ∩ Y d. None of these
13. For any two sets X and Y , (X ∩ Y) U (X ∩ Y^c) =
    b. Y b. X c. X UY d. None of these
14. If A and B are any two sets then $\overline{A\,X\,B}$
    a. $\bar{A}\,X\,B$ b. $A\,X\,\bar{B}$ c. $\bar{A}\,X\,\bar{B}$ d. None of these
15. If A = { 1 , 4 } , B = { 4 , 5 ,6 } and C = { 3 , 5 } Then (A –B) X C =
    a. { (1 ,3) , (1 , 5) , (4 , 3) , (4 , 5) }
    b. { (1 , 3) , (4 , 5) , (1 , 5) }
    c. { (1 , 6) , (1 , 5) , (4 , 6) }
    d. { (1 , 3) , (1 ,5) }
16. If A = { 1 , 2 } , B = { 3 , 4 , 5 } , C = { 4 , 5 , 6 } , then A X (B –C) =
    a. { (1 , 3) , (1 , 4) , (1 , 5) , (2 , 3) }
    b. { (1 , 3) , (2 , 3) , (2 , 6) }
    c. { (1 , 3) , (2 , 3) }
    d. None of these
17. If X = { a , b } , y = { 2 , 3 } , Z = { 3 , 5 } then X X (Y ∩ Z) =
    a. { (a , 3) , (b , 2) , (b , 3) }

b. { (a , 3) , (b , 3) }
c. { (a , 2) , (b ,3) , (b , 5) }
d. None of these

18. If A = { 1 , 2 , 3 } , B = { 2 , 3 , 4 } C = { 3, 4 , 5 } then (A X B) ∩ (A X C) =
a. { (1 , 3) , (1 , 4) , (2 , 3) , (2 , 4) }
b. { (1 , 2) , (1 , 3) , (1 , 4) , (2 , 3) , (2 , 4) , (2 , 5) }
c. { (1 , 3) , (1 , 4) , (2 , 2) , (2 , 3) , (2 , 5) , (3 , 3) , (3 , 4) }
d. None of these

19. If A = { 1 , 2 , 3 } and B = ∅ then A x B =
a. { (1 , 0) , (2 , 0) , (3 , 0) } b . { 0 } c. { ∅ } d. ∅

20. If A = ∅ and B = { 3 , 4 } , then A X B =
a. { (0 , 3) , (0 , 4) b. { ∅ } c. ∅ d. None of these

21. If I_A is the identity relation defined on a set A then I_A =
a. { (a ,b) : $a \in A, b \in B\ and\ a > b$}
b. { (a ,b) : $a \in A, b \in B\ and\ a < b$}
c. { (a ,b) : $a \in A, b \in B\ and\ a = b$}
d. None of these

22. If A and B are any two sets and A contains m elements and B contain n Elements then number of elements in A X B is
a. 2^{m+n} b $2^{m.n}$ c. 2^{m-n} d. None of these

23. If R and S are two relation and R^{-1} , S^{-1} are the inverse relation of R and S then $(RoS)^{-1}$ =
a. R^{-1} o S^{-1} b. R^{-1} o S c. R o S^{-1} d. S^{-1} o R^{-1}

24. Let A = { 1, 2 , 3 } and R = { (1, 1) , (2 , 2) , (2 , 3) , (3 , 3) } relation on A .Then R is
a. Reflexive and Symmetric but not transitive
b. Symmetric and transitive but not reflexive
c. Reflexive but neither symmetric nor transitive
d. None of these

25. Let A = { a, b , c } and R = { (a, a) , (b , b) , (c , c) , (a , b) ,(b , a) ,(b ,c) ,(c ,b) } is a relation on A .Then R is
a. Reflexive and Symmetric but not transitive
b. Symmetric and transitive but not reflexive
c. Reflexive but neither symmetric nor transitive
d. None of these

26. Let A = { x, y , z } and R = { (x, x) , (y , y) , (x, y) , (y , x) } is a relation on A .Then R is
a. Reflexive but neither symmetric nor transitive
b. Symmetric and transitive but not reflexive
c. Reflexive and Symmetric but not transitive
d. None of these

27. Let A be a non-empty set . Then the relation " ⊆" on the set P(A) is
a. Reflexive and symmetric not transitive
b. Symmetric and transitive but not reflexive
c. Reflexive but neither Symmetric nor transitive
d. Reflexive and transitive but not Symmetric

28. Let A = { a , b , c } and R = { (a, a) ,(b , b) , (c , c) , (a , b) , (b , a) } is an

Equivalence relation on A . Then equivalence class of a is

a. { a } b. { b } c. { a , b } d. { c }

29. Let X = { x, y , z } and R = { (x, x) , (y , y), (z , z) , (x, y) , (y , x) } is an Equivalence relation on X. Then equivalence class of z is

a. { x } b. { y } c. { x , y } d. { z }

30. If A = { a , b , c } and B = { d , e } , which of the following subset is a relation ?

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

31. The relation " congruence module m " is

a. Reflexive only b. Transitive only c. Symmetric only d. An equivalence relation

32. If R_1 and R_2 are two equivalence relation , then which of these is also an equivalence relation

a. $R_1 \cap R_2$ b. $R_1 U R_2^{-1}$ c, $R_1^{-1} \cap R_2$ d. None of these

33. Let A = { 1 , 2 , 3 } and B = { (1 , 1) , (2 , 2) } then

a. R is reflexive b. R is symmetric c. R is transitive d. None of these

34. The equivalence relation in a set is

a. Reflexive , Symmetric but not transitive
b. Reflexive , Transitive but not symmetric
c. Symmetric ,transitive but not reflexive
d. Reflexive ,Symmetric And transitive

35. If A = { a , b , c } then the relation R = { (a, b) ,(b , a) } is

a. Reflexive b. Symmetric c. Transitive d. none of these

36. Let f : R→ R be a mapping such that $f(x) = x^2/(1 + x^2)$, then f is

a. One –one b. many –one c. into d. onto

37. Every inverse mapping is

a. One –one –into b. One –one –onto c. Many – one –into d. none

38. Let f : A →B , where A = { a , b , c , d } , B = { 1 , 2, 3 , 4 , 5 } then f={ (a,1) , (b ,3) , (c, 2) , (d , 5) } is

a. One –one –into mapping
b. One –one –onto mapping
c. Many –one –into mapping
d. Many –one –onto mapping

39. If f : A →B and g: B → C are both one –one –onto mappings then gof : A → C is a

a. One-one-into b. one-one-onto c. Many –one –into d. many –one –onto

40. Which is correct ?

a. Every function is a relation.
b. Every relation is a function.
c. No function is a relation.
d. No relation is a function.

41. If f(x+y,x-y) = x.y then the arithmetic mean of f(x,y) and f(y,x) is

a. x b. y c. 0 d. None

42. If $f(x) = e^x$, where x is a real number then range of f is

a. Set of real numbers
b. Set of all positive real numbers
c. Sets of all rational number
d. None of these

43. If f: R → R and g : R → R defined by f(x) = cosx and g(x) = x^2 then (gof)(x) is

a. Cosx^2 b. x^2 c. $\cos^2 x$ d. None of these

44. If f : x → y and g : y → w where f and g are both one – one –onto then $(gof)^{-1}$ is equal to

a. $f^{-1}g^{-1}$ b. $g^{-1}.f^{-1}$ c.$(f.g)^{-1}$ d. None of these

45. The composition mapping fog of the maps f:R →R, f(x) = sinx and g : R→R,g(x) =$x^2$is

a.x^2 sinx b. $(\sin x)^2$ c. $\sin(x)^2$ d.sinx/x^3

46. If f(x) = logx then the arithmetic mean of f(x) and f(y) is

a. x b. y c. 0 d. None of these

47. If the function f : R →R and $\emptyset : R \to R$ be defined by f(x) = x^2 - |x| and $\emptyset(x)$ = x^2 + 1

Then the value of $(\emptyset \, of)(2)$ is

a. 3 b. 5 c. 20 d. None of these

48. If f : R →R where f(x) = x^2 + 1 then f^{-1} (-5) is

a. $\pm\sqrt{6}$ b. ∅ c. ± 6 d.± 5

49. If R denotes the set of real numbers , then the function f: R→R defined by f(x) =|x| x∈ R *is*

a. One –one –onto b. one –one –into c. Many –one –into d. None

50. Let f : R →R be defined by f(x) = 3x – 4 $\forall x \in R$ *then*

a. f is one –one –onto b. f is one –one –into

c. f is many –one –onto d. f is many –one –into

Linear Programming

1. A linear programming problem objective function is always :
   a. Linear b. Quadratic c. Cubic d. Constant
2. A linear programming problem is one that is concerned with
   a. Finding the upper limits of a linear function of several variable.
   b. Finding the lower limits of a linear function of several variable .
   c. Finding the limiting values of a linear function of several variable .
   d. Finding the optimal values (maximum or minimum) of a linear function of several variables .
3. A constraint in a L.P. model restricts .
   a. Value of the objective function
   b. Value of decision variable
   c. Use of the available resources
   d. All of the above
4. A feasible solution of L.P.P.
   a. Must satisfy all the constraints simultaneously
   b. Need not satisfy all the constraints
   c. Must be a corner point of the feasible regin
   d. All of the above
5. Maximization of objective function in L.P.P. means
   a. Value occurs at allowable set decision
   b. Height value is chosen among allowable decision
   c. None of the above
   d. All of the above
6. The linear function of the variable which to be maximize or minimize is called
   a. Constraints b. Objective function c. Decision variable d. None of these
7. The first step in formulating a linear programming problem is
   a. Identify any upper or lower bound on the decision variable
   b. State the constraints as linear combination of decision variables
   c. Understand the problem
   d. Identify the decision variable
8. Constraints in an L.P. model represents
   a. Limitation b. Requirements
   c. Balancing , Limitations and Requirements d. All of the above

9. A basic solution is called non –degenerate if
   a. All the basic variables are zero b. None of the basic variables is zero
   c. At least one of the basic variable is zero d. None of these

10. The feasible solution of a L. P. P. belongs to
   a. 1st and 2nd Quadrant b. 1st and 3rd Quadrant
   c. 2nd quadrant d. Only first quadrant

11. The value of the objective function is maximum under linear constraints
   a. At the Centre of feasible region
   b. at (0 , 0)
   c. At any vertex of the feasible region
   d. the vertex which is at maximum distance from (0 , 0)

12. Objective function of a L.P.P. is
   a. A constraint b. A function to be optimized
   c. A relation between the variables d. None of these

13. Which of the following statements is correct

a. Every L. P. P. admits an optimal solution

b. A L.P.P admits a unique optimal solution

c. If a L.P.P. admits two optimal solution it has an infinite number of optimal solution

d. the set of all feasible solutions of a L.P.P. is not a convex set

14. Max $z = 5x_1 + 3x_2$

Subject to $3x_1 + 5x_2 \leq 15$, $5x_1 + 2x_2 \leq 10$, $x_1, x_2 \geq 0$ is

a. $12\frac{7}{19}$ b. $15\frac{7}{19}$ c. $16\frac{7}{9}$ d. None of these

15. Minimum $z = 3x_1 + 5x_2$

Subject to $x_1 + 3x_2 \geq 3$, $x_1 + x_2 \geq 2$, $x_1, x_2 \geq 0$ is

a. 5 b. 7 c. 10 d. None of these

16. Maximum value of $z = 2x_1 + 3x_2$

Subject to $x_1 + x_2 \leq 1$, $3x_1 + x_2 \leq 4$, $x_1, x_2 \geq 0$ is

a. 2 b. 4 c. 3 d. None of these

17. Maximum value of $z = x_1 + 15x_2$

Subject to $2x_1 + 3x_2 \leq 6$, $3x_1 + 4x_2 \leq 4$, $x_1, x_2 \geq 0$ is

a. 2 b. 3 c. 4 d. None of these

18. Which one of the following is incorrect

a. A hyper plane is a convex set

b. Sphere is a convex set

c. Intersection of two convex sets is a convex set

d. Union of two convex sets is a convex set

19. The set of all convex combination of a finite number of points is a

a. Concave set b. Point c. Convex set d. None of these

20. If x can not be expressed as a convex combination of any two distinct points Y and Z then the point of a convex set is called

a. Boundary b. Hyper Plane c. Extreme point d. None of these

Trigonometry

1. The cube roots of -1 are:
   a. -1 , ½ (-1 $\pm i\sqrt{3}$) b. 1 , ½ (1 $\pm i\sqrt{3}$) c. -1 , ½ (1 $\pm i\sqrt{3}$) d. -1,-1,1
2. n^{th} roots of unity are in :
   a. A.P b. G.P. c. H.P. d. None of these
3. Product of n^{th} roots of unity is :
   a. $(-1)^n$ b. $(-1)^{n-1}$ c. $(-1)^{n+1}$ d. None of these
4. The fourth roots of unity are :
   a. ± 1 , $\pm i$ b. 0 , 1 , w , w^2 c. ± 1 , ± 2 d. None of these
5. The value of $(cos\theta + i\ sin\theta)^n$ is
   a. $cos^n\theta + isin^n\theta$ b. $cos\theta^n + isin\theta^n$ c. $\cos n\theta + isinn\theta$ d. None of these
6. If (a + ib) (c + id) (e + if) (g + ih) = A + iB then $(a^2 + b^2)(c^2+d^2)(e^2+f^2)(g^2+h^2)$ =
   a. $A^2 - B^2$ b. $A^2 + B^2$ c. $A^4 + B^4$ d. $A^4 - B^4$
7. If $z_r = \cos\frac{\pi}{2^r} + i\ \sin\frac{\pi}{2^r}$, r = 1 , 2 , 3, ……then z_1 ,z_2 ,z_3 ….. is
   a. 1 b. – i c. i d. -1
8. If $x = \cos\alpha + i\ \sin\alpha$, $y = \cos\beta + i\ sin\beta$, $z = cos\gamma + i\ sin\gamma$ and if x + y + z = 0,
   Then 1/x + 1/y + 1/z =
   a. 1 b. -1 c. 0 d. None of these
9. The equation whose roots are the n^{th} power of the roots of the equation
   $x^2 + 2x\cos\theta + 1 = 0$ is
   a. $x^2 - 2nx\cos\theta + n = 0$ b. $x^2 - 2x\cos n\theta + 1 = 0$

   c. $x^2 - 2\cos^n\theta + 1 = 0$ d. $x^2 - 2x\cos n\theta + n = 0$

10. $\cos\frac{3\pi}{2} + i\ \sin\frac{3\pi}{2}$ is equal to

    a. 1 b. -1 c. – i d. i

11. If $x^{-1} = \cos\theta + i\ sin\theta$ then x + 1/x =

    a. $2\cos\theta$ b. $2\sin\theta$ c. $2\ i\sin\theta$ d. None of these

12. x + 1/x = 2 $\cos\theta$ then $x^m + 1/x^m$ =

    a. $2\cos m\theta$ b. $2^m\ cos^m\theta$ c. $2^m \cos m\theta$ d. None of these

13. $\frac{(\cos\theta + i\ sin\theta)^4}{(\cos\theta + i\ sin\theta)^5}$ =

    a. $(\cos\theta - i\ sin\theta)$ b. $(\cos 9\theta - i\ sin9\theta)$

    c. $(\sin\theta - i\ cos\theta)$ d. $(\sin 9\theta - i\ cos9\theta)$

14. If n is a positive integer then $(1 + i)^n + (1 - i)^n$ =

    a. $2^{(n+2)/2} \cos\frac{n\pi}{4}$ b. $2^{(n+2)/2} \sin\frac{n\pi}{4}$

    c. $2^{(n+2)/2} (\cos\frac{n\pi}{4} + i\ \sin\frac{n\pi}{4})$ d. None of these

15. The series $i^z = 1 + z + z^2/2! + z^3/3!$ ………. Is absolutely convergent for

a. $|z| < 1$ b. $|z| \leq 1$ c. $|z| \geq 1$ d. for all values of z

16. If $A.e^{2i\theta} + B.e^{2i\theta} = 5\ \cos 2\theta - 7i\ sin2\theta$ then

a. A = 5 , B = -7 b. A = -5 , B = 7 c. A = 1 , B = -6 d. A = -1 , B = 6

17. If z = x + iy then the modulus and amplitude of e^{z^2} are

a. $e^{x^2+y^2}, 2ixy$ b. $e^{x^2+y^2}, 2xy$ c. $e^{x^2-y^2}, 2ixy$ d. $e^{x^2-y^2}, 2xy$

18. $e^{\theta+\pi i} =$

a. $e^{-\theta}$ b. $-e^{-\theta}$ c. e^{θ} d. $-e^{\theta}$

19. The real part of $\sin^{-1}(\ \cos\theta + i\ sin\theta)$ is

a. $\cos^{-1}\sqrt{\sin\theta}$ b. $\log(\sqrt{\sin\theta} + \sqrt{1+\sin\theta}$

c. . $\sin^{-1}\sqrt{\sin\theta}$ d. . $\log(\sqrt{\cos\theta} + \sqrt{1+\cos\theta}$

20. If $z = r.e^{i\theta}$ then $\log z =$

a. $\log r$ b. $\log r + \theta$ c. $\log r + i\ \theta$ d. $\log r - i\ \theta$

21. $\log(\pm i) =$

a. $\pm i$ b. $\pm\frac{1}{2}\pi i$ c. $\pm\pi i$ d. $\pm 2\pi i$

22. General value of $\cos^{-1}(u + iv)\ is$

a. $2n\pi + \cos^{-1}(u + iv)$ b. $2n\pi - \cos^{-1}(u + iv)$

c. $2n\pi \pm \cos^{-1}(u + iv)$ d. None of these

23. General value of $\tan^{-1}(u + iv)\ is$

a. $n\pi + \tan^{-1}(u + iv)$ b. $2n\pi + \tan^{-1}(u + iv)$

c. $n\pi - \tan^{-1}(u + iv)$ d. $2n\pi - \tan^{-1}(u + iv)$

24. $\log(x.i) =$

a. $\log x + i\pi$ b. $\log x - i\pi$ c. $-\log x + i\pi$ d. $-\log x - i\pi$

25. In Gregory's series θ lies between

a. $0 \leq \theta \leq \frac{\pi}{4}$ b. $-\frac{\pi}{4} \leq \theta \leq \frac{\pi}{4}$ c. $-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{4}$ d. $-\frac{\pi}{4} < \theta \leq \frac{\pi}{4}$

26. If $-1 \leq x \leq 1$ than $\tan^{-1} x$ =

a. $x + \frac{x^3}{3} + \frac{x^5}{5} + \cdots$ .... b. $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$ ....

c. $x + \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$ ....

d. $x - \frac{x^2}{2} + \frac{x^3}{3} - \cdots$ ....

27. The value of $\frac{tan^2\theta}{2} - \frac{tan^4\theta}{4} + \frac{tan^6\theta}{6}$ .... is

a. $\sec\theta$ b. $\log\cos\theta$ c. $\log\sec\theta$ d. $\cos\theta$

28. Sum of the series $\frac{1}{2^3} - \frac{1}{3.2^7} + \frac{1}{5.2^{11}} - \cdots \ldots \ldots. to\ \infty$ is

a. $\frac{1}{4}\tan^{-1}\frac{1}{2}$ b. $\tan^{-1}\frac{1}{2^3}$ c. $\frac{1}{2}\tan^{-1}\frac{1}{4}$ d. None

29. The value of $(1 - \frac{1}{3^{\frac{1}{2}}}) - \frac{1}{3}(1 - \frac{1}{3^{\frac{3}{2}}}) + \frac{1}{5}(1 - \frac{1}{3^{\frac{5}{2}}})$ ....to ∞ is

a. $\frac{\pi}{4}$ b. $\frac{\pi}{6}$ c. $\frac{\pi}{12}$ d. None of these

30. The value of $(\frac{2}{3} + \frac{1}{7}) - \frac{1}{3}(\frac{2}{3^2} + \frac{1}{7^3}) + \frac{1}{5}(\frac{2}{3^5} + \frac{1}{3^5})$ - .... To ∞ is

a. $\frac{\pi}{2}$ b. $\frac{\pi}{8}$ c. $\frac{\pi}{6}$ d. $\frac{\pi}{4}$

31 . Value of the series $(\frac{1}{2} + \frac{1}{3}) - \frac{1}{3}(\frac{1}{2^3} + \frac{1}{3^3}) - \frac{1}{5}(\frac{2}{2^5} + \frac{1}{3^5})$ - .... To ∞ is

a. $\frac{\pi}{2}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{6}$ d. $\frac{\pi}{10}$

32. The values of the series $1 - \frac{1}{3.3} + \frac{1}{5.3^2} - \frac{1}{7.3^3} +$ ....to ∞ =

a. $\frac{\pi}{3\sqrt{3}}$ b. $\frac{\pi}{2\sqrt{2}}$ c. $\frac{\pi}{3\sqrt{2}}$ d. $\frac{\pi}{2\sqrt{3}}$

33. The value of the series 1-1\3.2^2 + 1\5.2^4 – 1\7.2^6 + ... to ∞ is

a. $3\tan^{-1} 1\backslash 3$ b. $1.\tan^{-1} 1$ c. $4\tan^{-1} 1\backslash 4$ d. $2\tan^{-1} 1\backslash 2$

34. The series $\frac{\pi}{4} + \frac{1}{2} - \frac{1}{3}.\frac{1}{2^3} + \frac{1}{5}\frac{1}{2^5} \ldots \ldots \ldots . . is\ equal\ to$

a. $\tan^{-1} 3$ b. $\tan^{-1} 2$ c. $\tan^{-1} 4$ d. $\tan^{-1} 1$

35. Value of $cosh^2\theta + sinh^2\theta$ is

a. 0 b. 1 c. $\cosh 2\theta$ d. None of these

36. Which of the following result is incorrect ?

a. sinz = isinhizx

b. cosz = coshiz

c. tanz = -itanizx

d. none of these

37. $\sinh(\alpha + i\beta) =$

a. $\sinh\alpha \cos\beta - i\cosh\alpha \sin\beta$

b. $\sinh\alpha \cos\beta + i\cosh\alpha \sin\beta$

c. $\sin\alpha \cosh\beta + i\cos\alpha \sinh\beta$

d. $\sin\alpha \cosh\beta - i\cosh\alpha \sinh\beta$

38. . If $\cos(\theta + i\emptyset) = \rho(cos\alpha + i\ sin\alpha)$ then the value of $\rho\ sin\alpha$ is

a. $cos\theta . cosh\emptyset$ b. $-cos\theta . cosh\emptyset$

c. $sin\theta . sinsh\emptyset$ c. $-sin\theta . sinh\emptyset$

39. The real root of $\sin^2(x + iy)$ is

a. ½ (1 – cos2x cosh2y) b. ½ cos2x cosh2y

c. ½ (1 – sin2x sinh2y) d. ½ (1 + sin2x sinh2y)

40. . $\tanh^{-1}z$ =

a. ½ $\log\frac{1+z}{1-z}$ b. $\log\frac{1-z}{1+z}$ c. $\frac{1}{4}\log\frac{1-z}{1+z}$ d. None

41. If $\tan^{-1}(x + iy) = A + iB$, then A =

a. $\tan^{-1}\frac{2x}{1+x^2+y^2}$ b. $\tan^{-1}\frac{2x}{1-x^2-y^2}$ c. $\frac{1}{2}\tan^{-1}\frac{2x}{1-x^2-y^2}$ d. $\frac{1}{2}\tan^{-1}\frac{2x}{1+x^2+y^2}$

Matrix

1. If $\begin{pmatrix} x+y+z \\ x+y \\ y+z \end{pmatrix} = \begin{pmatrix} 9 \\ 5 \\ 7 \end{pmatrix}$ then the value of x , y , z are

a. x=3 ,y=2 , z=4 b. x=2, y = 4 , z = 3 c. x = 2 , y = 3 , z = 4 d. x =3 , y = 3, z = 2

2. Matrix (a_{ij})$_{3X4}$, where a_{ij} = i.j is written as

a. $\begin{pmatrix} 1 & 2 & 4 & 3 \\ 2 & 4 & 8 & 6 \\ 3 & 6 & 9 & 12 \end{pmatrix}$ b. $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ 3 & 6 & 12 & 9 \end{pmatrix}$

c. $\begin{pmatrix} 1 & 3 & 2 & 4 \\ 2 & 6 & 4 & 8 \\ 3 & 12 & 6 & 9 \end{pmatrix}$ d. None of these

3. Two matrices A and B will be conformable for the product A .B if

a. They are of the same order

b. Number of rows in A and number of columns in B are equal

c. Number of rows in A and B are equal

d. Number of columns in A is equal to number of rows in B

4. A matrix A = [a_{ij}] where a_{ij} = 0 if $i \neq j$ and 1 if i=j is written as

a. $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{pmatrix}$ b. $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 1 \end{pmatrix}$ c. $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ d. None

5. $4\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix} - \frac{1}{2}\begin{bmatrix} 6 & 4 \\ 4 & 8 \end{bmatrix}$ is equal to

a. $\begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ b. $\begin{bmatrix} -1 & -1 \\ -2 & -1 \end{bmatrix}$ c. $\begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix}$ d. None

6. If $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 14 \\ 15 & 14 \end{bmatrix}$ then the value of x and y are

a. x = 2 , y = -9 b. x = -2 , y = -9 c. x = -2 , y = 9 d. x = 2 , y = 9

7. If $x\begin{pmatrix} 2 \\ 1 \end{pmatrix} + y\begin{pmatrix} 3 \\ 5 \end{pmatrix} + \begin{pmatrix} 4 \\ 6 \end{pmatrix} = \begin{pmatrix} 12 \\ 17 \end{pmatrix}$ then the values of x and y are

a. x=2 , y = 1 b. x = -2 , y = 1 c. x = 1 , y = 2 d. None of these

8. If $\begin{pmatrix} x^2 \\ y^2 \end{pmatrix} + 2\begin{pmatrix} 2x \\ 3y \end{pmatrix} = 3\begin{pmatrix} 7 \\ -3 \end{pmatrix}$ then

a. x = 3, -3 and y = -7 b. x = 3 , -7 and y = -3 c. x = 3 , 7 and y = -3 d. None of these

9. If A = $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and B = $\begin{pmatrix} 3 & 5 & 1 \\ 1 & 2 & 3 \end{pmatrix}$ then A . B =

a. $\begin{pmatrix} 5 & 9 & 7 \\ 13 & 23 & -15 \end{pmatrix}$ b. $\begin{pmatrix} 5 & 9 & -7 \\ 13 & 23 & 15 \end{pmatrix}$ c. $\begin{pmatrix} 5 & 9 & 7 \\ 13 & 23 & 15 \end{pmatrix}$ d. None of these

10.If A + B = $\begin{pmatrix} 1 & 0 & 2 \\ 5 & 4 & -6 \\ 7 & 3 & 8 \end{pmatrix}$ and A - B = $\begin{pmatrix} -5 & -4 & 8 \\ 11 & 2 & 0 \\ -1 & 7 & 4 \end{pmatrix}$ then the value of B is

a. $\begin{pmatrix} 3 & 2 & 3 \\ -3 & 1 & 3 \\ 4 & -2 & 2 \end{pmatrix}$ b. $\begin{pmatrix} 3 & 2 & -3 \\ -3 & 1 & -3 \\ 4 & -2 & 2 \end{pmatrix}$ c. $\begin{pmatrix} 3 & -3 & 2 \\ -3 & -3 & 1 \\ 4 & 2 & -2 \end{pmatrix}$ d. None

11. If 2A + 3B = $\begin{pmatrix} 2 & 7 & 12 \\ 13 & 12 & 23 \end{pmatrix}$ and A – 2B = $\begin{pmatrix} 1 & 0 & -1 \\ -4 & -1 & -6 \end{pmatrix}$ then the value of A is

a. $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \end{pmatrix}$ b. $\begin{pmatrix} 2 & 3 & 1 \\ 3 & 4 & 2 \end{pmatrix}$ c. $\begin{pmatrix} 3 & 2 & 1 \\ 4 & 3 & 2 \end{pmatrix}$ d. None

12.If B = $\begin{pmatrix} 5 & -2 \\ 4 & 7 \end{pmatrix}$, C = $\begin{pmatrix} 1 & 2 \\ 6 & -3 \end{pmatrix}$ and A = $\begin{pmatrix} x & y \\ z & w \end{pmatrix}$ such that 2A = 3B -2C , then A =

a. $\begin{pmatrix} \frac{13}{2} & 5 \\ 0 & \frac{27}{2} \end{pmatrix}$ b. $\begin{pmatrix} \frac{13}{2} & -5 \\ 0 & -\frac{27}{2} \end{pmatrix}$ c. $\begin{pmatrix} \frac{13}{2} & -5 \\ 0 & \frac{27}{2} \end{pmatrix}$ d. None of these

13. If A = $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ then A^2 is equal to

a. null matrix b. Unit matrix c. –A d. A

14. If two matrices A and B are conformal for the product A.B then $(A.B)^T$ =

a. $A^T . B^T$ b. $A^T . B$ c. $A . B^T$ d. $B^T . A^T$

15. For a symmetric matrix A is

a. A = -A b. $A = -A^T$ c. $A = A^T$ d. None

16. For a skew-symmetric matrix A is

a. A = -A b. $A = -A^T$ c. $A = A^T$ d. None

17. If $\begin{pmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 5 & 6 & 7 \end{pmatrix}$ = A + B , where A is symmetric and B is Skew-Symmetric then A =

a. $\begin{pmatrix} 1 & \frac{5}{2} & -4 \\ \frac{5}{2} & 4 & \frac{11}{2} \\ -4 & \frac{11}{2} & 7 \end{pmatrix}$ b. $\begin{pmatrix} 1 & -\frac{5}{2} & 4 \\ -\frac{5}{2} & 4 & \frac{11}{2} \\ 4 & \frac{11}{2} & 7 \end{pmatrix}$ c. $\begin{pmatrix} 1 & \frac{5}{2} & 4 \\ \frac{5}{2} & 4 & \frac{11}{2} \\ 4 & \frac{11}{2} & 7 \end{pmatrix}$ d. None

18. If $\begin{pmatrix} 1 & \alpha & 1 \\ \beta & 1 & 1 \\ 1 & 1 & \gamma \end{pmatrix}$ = X + Y , where X is symmetric and Y is Skew-Symmetric then Y =

a. $\begin{pmatrix} 0 & -\frac{\alpha-\beta}{2} & 0 \\ \frac{\alpha-\beta}{2} & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$ b. $\begin{pmatrix} 0 & \frac{\alpha-\gamma}{2} & \frac{\alpha-\beta}{2} \\ \frac{\alpha-\gamma}{2} & 0 & \frac{\beta-\gamma}{2} \\ 0 & 0 & 0 \end{pmatrix}$ c. $\begin{pmatrix} 0 & \frac{\alpha-\beta}{2} & 0 \\ -\frac{\alpha-\beta}{2} & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$ d. None]

19. If A = $\begin{pmatrix} 1 & 3 & 2 \\ 1 & 0 & 5 \end{pmatrix}$ and B = $\begin{pmatrix} 3 & 1 \\ -2 & 0 \\ 4 & 3 \end{pmatrix}$ then B' . A' =

a $\begin{pmatrix} 5 & -23 \\ 7 & 16 \end{pmatrix}$ b. $\begin{pmatrix} 5 & 23 \\ 7 & -16 \end{pmatrix}$ c. $\begin{pmatrix} 5 & 23 \\ -7 & 16 \end{pmatrix}$ d. $\begin{pmatrix} 5 & 23 \\ 7 & 16 \end{pmatrix}$

20. If A^* and B^* be the transposed conjugate of A and B respectively then

a. $(A.B)^* = A^*.B^*$ b. $(A.B)^* = A^*.B$ c. . $(A.B)^* = B^*.A^*$ d. . $(A.B)^* = A.B^*$

21. If A * be the transposed conjugate of A and K being any Complex numbers , then

a. $(k.A)^* = K. A^*$ b. $(K.A)^* = \bar{k} . A^*$ c. $(K.A)^* = \bar{k} . A$ d. None

22. If $\bar{A}$ and $\bar{B}$ be conjugates of A and B respectively A and B respectively and A and B being

Conformable to multiplication , then

a.($\overline{A.B} = \bar{A}.B$ b. $\overline{A.B} = \bar{A}.\bar{B}$ c. $\overline{A.B} = \bar{B}.\bar{A}$ d. $\overline{A.B} = A.\bar{B}$

23. If A^* and B^* be the transposed conjugate of A and B respectively and A ,B being conformal to

Multiplication then

a. $(A.B)^* = A.B^*$ b. $(A.B)^* = A^*.B$ c. $(A.B)^* = A^*.B^*$ d. $(A.B)^* = B^*.A^*$

24. A complex square matrix Z = (z_{ij}) is said to be Hermitian if

a. $z_{ij} = z_{ji}$ b. $z_{ij} = - z_{ji}$ c. $z_{ij} = \overline{z_{ji}}$ d. $z_{ij} = -\overline{z_{ji}}$

25. A complex square matrix Z = (z_{ij}) is said to be skew-Hermitian if

a. $z_{ij} = \overline{z_{ji}}$ b. $z_{ij} = -\overline{z_{ji}}$ c. $z_{ij} = z_{ji}$ d. $z_{ij} = - z_{ji}$

26. If A is a square matrix and A = P + Q where P is a Hermitian matrix and Q is skew-Hermitian matrix then Q =

a. $\frac{1}{2}(A + \bar{A})$ b. $\frac{1}{2}(A - \bar{A})$ c. $\frac{1}{2}(A + A^*)$ d. $\frac{1}{2}(A - A^*)$

27. If A is a square matrix and A = P + iQ where P is a Hermitian matrix and Q is skew-Hermitian matrix then Q =

a. $\frac{1}{2}(A + A^*)$ b. . $\frac{1}{2i}(A + A^*)$ c. $\frac{1}{2i}(A - A^*)$ d. None

28. If A is a hermitian matrix , then

a. $A = A^*$ b. $A = - A^*$ c. $A = iA^*$ d. None

29. If A and B be two non-singular matrices of the same order , then

a. $(A . B)^{-1} = A^{-1} .B^{-1}$ b. $(A . B)^{-1} = A^{-1} .B$ c. $(A . B)^{-1} = A .B^{-1}$ d. $(A . B)^{-1} = B^{-1} .A^{-1}$

30. If A is a non – singular matrix , then

a. $(A')^{-1} = A$ b. $(A')^{-1} = A^{-1}$ c. $(A')^{-1} = (A^{-1})'$ d. $(A')^{-1} = - A'$

31. Adjoint of the matrix A = $\begin{pmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{pmatrix}$ is

a. $\begin{pmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & \cos\alpha \end{pmatrix}$ b. $\begin{pmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{pmatrix}$ c. $\begin{pmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & -\cos\alpha \end{pmatrix}$ d. None

32. If $\begin{pmatrix} 2-3i & 1+i \\ 2-i & 5+3i \end{pmatrix}$ = M + iN , where M and N be hermitian Then N =

a. $\begin{pmatrix} -3 & \frac{i}{2} \\ -\frac{i}{2} & 3 \end{pmatrix}$ b. $\begin{pmatrix} -3 & -\frac{i}{2} \\ \frac{i}{2} & 3 \end{pmatrix}$ c. $\begin{pmatrix} 0 & \frac{i}{2} \\ \frac{i}{2} & 3 \end{pmatrix}$ d. None of these

33. If M = $\begin{pmatrix} 4 & K+2 \\ 2k-3 & K+1 \end{pmatrix}$ is a symmetric matrix then K =

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

34. If A is symmetric as well as skew-symmetric then A is

a. Hermitian matrix b. Null matrix c. Triangular matrix d. None of these

35. If A = $\begin{pmatrix} 3 & 1 & -1 \\ 0 & 1 & 2 \end{pmatrix}$ then A,A' is a

a. Symmetric matrix b. Skew – symmetric matrix c. Conjugate matrix d. None

36. If A is a skew –symmetric matrix and "n" is an odd positive then A^n is a

a. Symmetric matrix   b. Skew – symmetric matrix   c. Conjugate matrix   d. None

37. If A is orthogonal matrix , where A = $\frac{1}{3}\begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{pmatrix}$ then

a. a = 2 , b = 1   b. a = - 2 , b = -1   c. a = 2 , b = -1   d. a = -2 , b = 1

38. If A and B be two square matrix , then

a. adj(A . B) = adjA . adj B   b. adj(A .B) = adjA' .adjB

c. adj (A .B) = adj A .adjB'   c. adj (A . B) = adjB .adjA

39. If A and B be two non-singular matrices then

a. $(A . B)^{-1} = A^{-1} . B^{-1}$ b. $(A . B)^{-1} = A^{-1} . B$ c. $(A . B)^{-1} = A . B^{-1}$ d. . $(A . B)^{-1} = B^{-1} . A^{-1}$

40. If A be an m X n non –singular matrix , then $(A^T)^{-1}$ =

a. A^T b. A^{-1} c. $(A^{-1})^T$ d. A^T

41. Product of two orthogonal matrices is

a. Orthogonal   b. Involutory   c. Unitary   d. Idempotent

42. If A = = $\begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix}$ then adj A is

a. $\begin{pmatrix} 7 & -3 \\ -5 & 3 \end{pmatrix}$ b. $\begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix}$ c. $\begin{pmatrix} 7 & 3 \\ 5 & 2 \end{pmatrix}$ d. $\begin{pmatrix} -7 & 3 \\ 5 & -2 \end{pmatrix}$

43. If A = $\begin{pmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{pmatrix}$ then A^{-1} =

a. $\begin{pmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & -\cos\alpha \end{pmatrix}$ b. $\begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & -\cos\alpha \end{pmatrix}$ c. $\begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{pmatrix}$ d. None

44. The rank of the matrix $\begin{pmatrix} 2 & 3 & 4 \\ 3 & 1 & 2 \\ -1 & 2 & 2 \end{pmatrix}$ is

a. 3   b. 2   c. 1   d. None

45. Let M = $\begin{pmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{pmatrix}$ where $x \neq y \neq z$ then $\rho(M) is$

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

Analytic Geometry of Two Dimensions

1. Radius to the circle $x^2 + y^2 - x - y + 16 = 0$ is
   a. Real b. Vanishes c. Imaginary d. None of these
2. Conditions that the general equation of second degree in x and y i.e $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ should represented a circle are
   a. a = b b. h = 0 c. both (a) and (b) d. None of these

3. If θ is the angle between two circles $x^2 + y^2 + 2g_1x + 2f_1y + c_1 = 0$

   And $x^2 + y^2 + 2g_2x + 2f_2y + c_2 = 0$, then $\cos\theta =$

   a. $\pm\frac{2g_1g_2+2f_1f_2+c_1+c_2}{\sqrt{g_1{}^2+f_1{}^2-c_1}\sqrt{g_2{}^2+f_2{}^2-c_2}}$ b. $\pm\frac{2g_1g_2+2f_1f_2-c_1-c_2}{2\sqrt{g_1{}^2+f_1{}^2-c_1}\sqrt{g_2{}^2+f_2{}^2-c_2}}$

   c. $\pm\frac{2g_1g_2+2f_1f_2-c_1-c_2}{\sqrt{g_1{}^2+f_1{}^2-c_1}\sqrt{g_2{}^2+f_2{}^2-c_2}}$ d. None of these

4. Necessary condition that the two circles $x^2 + y^2 + 2g_1x + 2f_1y + c_1 = 0$

   And $x^2 + y^2 + 2g_2x + 2f_2y + c_2 = 0$, may cut one another orthogonally is

   a. $g_1g_2+f_1f_2+c_1+c_2 = 0$ b. $g_1g_2+f_1f_2-c_1-c_2 = 0$

   c. $2g_1g_2+2f_1f_2+c_1+c_2 = 0$ d. $2g_1g_2+2f_1f_2-c_1-c_2 = 0$

5. Let PQ is a tangent drawn from the point P to the circle , whose centre is A . Then power

   Of the point P w.r. to circlre is

   a. OP^2 b. PQ^2 c. $OP^2 - PQ^2$ d. $OP^2 + PQ^2$

6. Radical axis of two circles $x^2 + y^2 + 2g_1x + 2f_1y + c_1 = 0$ and $x^2 + y^2 + 2g_2x + 2f_2y + c_2 = 0$ is

   a. $2(g_1 - g_2)x + 2(f_1-f_2)y + c_1-c_2 = 0$ b. $2(g_1 - g_2)x + 2(f_1-f_2)y + c_1+c_2 = 0$

   c. $2(g_1 + g_2)x + 2(f_1+f_2)y + c_1+c_2 = 0$ d. None of these

7. Radical axis of the circles $x^2+y^2 = 7$ and $x^2 + y^2 - 8x - 10y - 4 = 0$ is

   a. 8x + 10y + 3 = 0 b. 8x - 10y + 3 = 0 c. 8x + 10y - 3 = 0 d. 8x - 10y - 3 = 0

8. Equation (in standard form) of system of co –axial circles is

   a. $x^2 + y^2 + 2gx - c = 0$ b. $x^2 + y^2 + 2gx + c = 0$ c. $x^2 - y^2 + 2gx - c = 0$ d. $x^2 + y^2 - 2gx - c = 0$

9. If $x^2 + y^2 + 2g_1x + c_1 = 0$ and $x^2 + y^2 + 2g_2x + c_2 = 0$ are two circles of a co –axial system , the of

   Intersection of these two circles are:

   a. (0 , $\sqrt{c}$), (0 ,- $\sqrt{c}$) b. (0 , $\sqrt{c}$), (0 , $\sqrt{-c}$)

   c. (0 , $\sqrt{-c}$), (0 ,- $\sqrt{c}$) d. (0 , $\sqrt{-c}$), (0 ,- $\sqrt{-c}$)

10. Limiting points of system of co –axial circles $x^2 + y^2 + 2gx + c = 0$ are

a. ($\sqrt{c}$, 0), ($\sqrt{-c}$, 0)

b. ($\sqrt{c}$, 0), ($-\sqrt{c}$,0)

c. ($\sqrt{c}$, 0), ($\sqrt{c}$, 0)

d. ($-\sqrt{c}$, 0), (0 , $\sqrt{c}$)

11. For what value of K , the circles $x^2 + y^2 + 5x + 3y + 7 = 0$ and $x^2 + y^2 - 8x + 6y + K = 0$ are orthogonal ?

a. -18 b. 18 c. 6 d. 7

12. Equation of the circle having centre at (2 , -1) with radius 4 is

a. $x^2 + y^2 + 4x + 2y - 11 = 0$

b. $x^2 + y^2 - 4x + 2y + 11 = 0$

c. $x^2 + y^2 - 4x + 2y - 11 = 0$

d. $x^2 + y^2 + 4x - 2y + 11 = 0$

13. For what value of P, the circles $x^2 + y^2 + Px + 3y - 5 = 0$ and $x^2 + y^2 + 5x + Py + 7 = 0$ are

Orthogonal to each other.

a. 1/2 b. 1/3 c. 1/4 d. -1/2

14. Angle between radical axis of two circles and the line joining their centre is

a. $\frac{\pi}{6}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{3}$ d. $\frac{\pi}{2}$

15. Radical axis of the circles : $x^2 + y^2 + 2x + 3y - 7 = 0$ and $x^2 + y^2 - 2x - y + 1 = 0$ is

a. $x – y = 2$ b. $x + y = 2$ c. $x + 2y = 2$ d. $2x + y = 2$

16. Equation of the circle whose centre is (1 , 2) and which cuts orthogonally the circle

$x^2 + y^2 - 3x + 4y + 5 = 0$ is

a. $x^2 + y^2 - 2x + 4y + 10 = 0$

b. $x^2 + y^2 - 2x - 4y + 10 = 0$

c. $x^2 + y^2 - 2x - 4y - 10 = 0$

d. None of these

17. . Equation of the circle which passes through (1 , 2) and through the points of intersection of the circle $x^2 + y^2 - 5x - 2y + 8 = 0$ and $x^2 + y^2 - 3x - y + 6 = 0$ is

a. $x^2 + y^2 - 9x - 4y + 12 = 0$

b. $x^2 + y^2 - 9x - 4y - 12 = 0$

c. $x^2 + y^2 + 9x + 4y + 12 = 0$

d. None of these

18. If e the eccentricity of a parabola $y^2 = 4ax$ then

a. $e<1$ b. $e = 1$ c. $e > 1$ d. $e = 0$

19. Latus Rectum of a parabola $y^2 = 4ax$ is

a. 2a b. 3a c. 4a d. 6a

20. In the parabola $x^2 + 4ay = 0$, focus is

a. (0 , a) b. (a , 0) c. (-a , 0) d. (0 , -a)

21. In the parabola $y^2 + 4ay = 0$, focus is

a. (-a , 0)   b. (a , 0)   c. (0 , a)   d. (0 , -a)

22. In the ellipse $x^2/a^2 + y^2/b^2 = 1$

a. $b^2 = a^2 (1 + e^2)$ b. $b^2 = a^2 (1 - e^2)$ c. $b^2 = a^2 (e^2 - 1)$ d. None of these

23. Latus rectum of the ellipse $x^2/a^2 + y^2/b^2 = 1$ is

a. $2a(1 + e^2)$ b. $2a(e^2 - 1)$ c. $2a(1 - e^2)$ d. None of these

24. Sum of the focal distance of any point on an ellipse is

a. 2a   b. 4a   c. 6a   d. a

25. In a hyperbola $x^2/a^2 - y^2/b^2 = 1$, eccentricity (e)

a. $e < 1$ b. $e = 1$ c. $e > 1$ d. $e = 0$

26. Equation of the parabola whose focus is (5 , 3) and derictrix the line $3x - 4y + 1 = 0$ is

a. $16x^2 + 9y^2 + 24xy + 256x + 142y + 849 = 0$

b. $16x^2 + 9y^2 + 24xy - 256x - 142y + 849 = 0$

c. $16x^2 + 9y^2 + 24xy - 256x - 142y = 0$

d. None of these

27. If the point (2 , 3) is the focus and $x = 2y + 6$ is the derictrix of a parabola , then equation of axis is

a. $2x + y = 7$ b. $2x - y = 7$ c. $2x + y + 7 = 0$ d. None of these

28. If the parabola $x^2 = 4ay$ passes through ($2\sqrt{3}, \frac{1}{2}$) then latus rectum is

a. 8   b. 12   c. 16   d. 24

29. The foci of an ellipse are ($\pm 2 , 0$) and its eccentricity ½ then its equation is

a. $x^2/12 + y^2/16 = 1$ b. $x^2/16 + y^2/12 = 1$ c. $x^2/16 + y^2/18 = 0$ d. None

30. Eccentricity of the ellipse $3x^2 + 4y^2 = 12$ is

a. 1/6   b. ¼   c. ½   d. None

31. Centre of the ellipse $2x^2 + 3y^2 - 4x + 5y + 4 = 0$ is

a. (1 , -5/6)   b. (1 , 5/6)   c. (-1 , 5/6)   d. None

32. Equation of the hyperbola whose eccentricity is $\sqrt{2}$ and distance between foci is 16 is

a. $x^2 + y^2 = 32$ b. $x^2 - y^2 = 32$ c. $x^2 - y^2 = 16$ d . None of these

33. Centre of the hyperbola $x^2 - 2y^2 - 2x + 8y - 1 = 0$ is

a. (1 , -2)   b. (-1 , 2)   c. (1 , 2)   d. None of these

34. In a hyperbola $4x^2 – 9y^2 = 36$ latus rectum is

a. 4/3 b. 8/3 c. 3/2 d. None of these

35. Equation of the tangent to the parabola $y^2 = 4ax$ at the point (at^2 ,2at) is

a. $ty = x + at^2$ b. $tx = y + at^2$ c. $ty = ax + t^2$ d. None of these

36. Equation of the tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ at point $(a\cos\emptyset , b\sin\emptyset)$ is

a. $\frac{x\cos\emptyset}{a} + \frac{y\sin\emptyset}{b} = 1$ b. $\frac{x\cos\emptyset}{a^2} + \frac{y\sin\emptyset}{b^2} = 1$

c. $\frac{x\sin\emptyset}{a} + \frac{y\cos\emptyset}{b} = 1$ d. $\frac{x\sin\emptyset}{a^2} + \frac{y\sin\emptyset}{b^2} = 1$

37. Condition that the line y = mx + c may touch the ellipse $x^2/a^2 + y^2/b^2 = 1$ is

a. $y = mx + \sqrt{a^2m^2+b^2}$ b. $y = mx - \sqrt{a^2m^2+b^2}$

c. both (a) and (b) d. None of these

38. The equation of normal to the parabola $y^2 = 4ax$ at point (a/m^3 , 2a /m) is

a. $y = mx – 2am + am^3$ b. $y = mx – 2am - am^3$

c. $y = mx + 2am + am^3$ d. $y = mx – 2am + am^3$

39. Co – ordinates of the centre of the conic $x^2 - 3xy + y^2 + 10x – 10y + 21 = 0$ is

a. (2 , 2) b. (2 , - 2) c. (-2 , -2) d. (-2 , 2)

40. If the line 2x + 3y = 1 touches the parabola $y^2 = 4ax$ then length of latus rectum is

a. 8/9 b. 4/9 c. 2/9 d. None of these

41. Equation of tangent to the parabola $y^2 = 3x$ at the point (3 , -3) is

a. x + 2y = 3 b. x + 2y + 3 = 0 c . x – 2y + 3 = 0 d. None of these

42. Equation of the normal to the parabola $y^2 = 2x$ at (2 , -2) is

a. 2x = y + 6 b. 2y = x + 6 c. 2x = y – 6 d. 2y = x – 6

43. Condition that the line p = $\mathrm{p} = \mathrm{x}\cos\alpha + \mathrm{y}\sin\alpha$ touches the ellipse $x^2/a^2 + y^2/b^2 = 1$ is

a. $p^2 = a^2cos^2\alpha - b^2sin^2\alpha$ b. $p^2 = a^2sin^2\alpha + b^2cos^2\alpha$

c. $p^2 = a^2cos^2\alpha + b^2sin^2\alpha$ d. $p^2 = a^2sin^2\alpha - b^2cos^2\alpha$

44. Equation of tangent at the point ($\sqrt{3}$, 2) the ellipse $4x^2 + 3y^2 = 24$ is

a. $2\sqrt{3}x - 3y = 12$ b. $2\sqrt{3}x + 3y = 12$

c. $3x + 2\sqrt{3}y = 12$ d. $3x - 2\sqrt{3}y = 12$

45. Equation of hyperbola with foci (6 ,4) and (-4 , 4) and eccentricity = 2 is

a. $12x^2 – 4y^2 = 75$ b. $12x^2 – 7y^2 = 50$

c. $4x^2 - 12y^2 = 75$ d. $7x^2 - 12y^2 = 100$

Analytic Geometry of three dimensions

1. If the direction cosines of a line PQ be l,m,n then direction cosines of QP will be
   a. l,m,-n b. l,-m , -n c. –l,- m , -n d. l , - m , n
2. If l , m , n and a, b , c be the direction cosines and direction ratios of a line , then
   a. $l = \pm \frac{a}{\sqrt{a^2+b^2+c^2}}$, $m = \pm \frac{b}{\sqrt{a^2+b^2+c^2}}$, $n = \pm \frac{c}{\sqrt{a^2+b^2+c^2}}$
   b. $l = \frac{-a}{\sqrt{a^2+b^2+c^2}}$, $m = \frac{-b}{\sqrt{a^2+b^2+c^2}}$, $n = \frac{c}{\sqrt{a^2+b^2+c^2}}$
   c. $l = \frac{a}{\sqrt{a^2+b^2+c^2}}$, $m = \frac{b}{\sqrt{a^2+b^2+c^2}}$, $n = \frac{-c}{\sqrt{a^2+b^2+c^2}}$
   d. None of these
3. Direction ratios of the line segment PQ joining two point P (x_1 ,y_1 , z_1) and Q(x_2 , y_2 , z_2) are
   a. $X_1 + x_2$, $y_1 + y_2$, $z_1 + z_2$
   b. $X_2 - x_1$, $y_2 - y_1$, $z_2 - z_1$
   c. $-X_1 - x_2$, $-y_1 - y_2$, $-z_1 - z_2$
   d. $X_1 - x_2$, $y_1 - y_2$, $z_1 - z_2$
4. Two lines whose direction cosines are l_1 , m_1 , n_1 and l_2 ,m_2 , n_2 are parallel to each other is
   a. $L_1l_2 + m_1m_2 + n_1n_2 = 0$
   b. $L_1l_2 + m_1m_2 + n_1n_2 = 1$
   c. $L_1/l_2 = m_1/m_2 = n_1/n_2$
   d. None of these
5. Two lines whose direction ratios are a, b , c are perpendicular to each other if
   a. $a_1a_2 + b_1b_2 + c_1c_2 = 0$
   b. $a_1a_2 + b_1b_2 + c_1c_2 = 1$
   c. $a_1/a_2 = b_1/b_2 = c_1/c_2$
   d. None of these
6. Direction ratios of the line drawn from the point (3 , -5 , 4) to the point (-6 , 1 , 2) are
   a. 9 , 6 , -2 b. 9 , -6 , 2 c. -9 , 6 , 2 d. -9 , 6 , -2
7. The co-ordinates of a point A are (2 , 3 , 6) . then the directions cosines of OA where O is origin are
   a. 2/7 ,-3/7 , -6/7 b. 2/7 ,3/7 , 6/7 c. -2/7, -3/7 , 6/7 d. None of these
8. If the direction ratios of two lines are 1 , 1 , 0 and 2,1 , 2 then acute angle between two line is
   a. 30° b. 45° c. 60° d. 90°
9. Angle between two diagonals of cube is
   a. $\cos^{-1}\frac{1}{5}$ b. $\cos^{-1}\frac{1}{4}$ c. $\cos^{-1}\frac{1}{3}$ d. $\frac{\pi}{2}$
10. If the lines joining the points A(p , 1 , -1) and B (2p , 0 , 2) is perpendicular to the line from B to C (2 + 2p , p , 1) then p =
    a. 0 b. 1 c. 2 d. 3
11. If the foot of the normal drawn from the origin to the plane is the point (2 , 3 , 1) . then equation of the plane is
    a. 2x + 3y + z = 14 b. 2x – 3y + z = 14 c. 2x + 3y + z +14 = 0 d. None of these
12. Perpendicular distance from the point (7 , 3 , 4) to the plane 6x – 3y + 2z – 13 = 0 is
    a. 2 b. 3 c. 4 d. 5
13. Area of the ΔABC whose vertices are (a, 0 ,0) , (0 , b , 0) and (0 , 0 , c) is
    a. $\frac{1}{2}\sqrt{a^2+b^2+c^2}$ b. $\frac{1}{2}\sqrt{a^2b^2+b^2c^2+c^2a^2}$ c. $\frac{a+b+c}{2\sqrt{a^2+b^2+c^2}}$ d. None of these
14. The perpendicular distance from (x_1 , y_1 , z_1) to the plane ax + by + cz + d = 0 is

a. $\frac{ax_1+by_1+cz_1}{\sqrt{a^2+b^2+c^2}}$ b. $\frac{ax_1+by_1+cz_{1+d}}{\sqrt{a^2+b^2+c^2}}$ c. $\frac{ax_1+by_1+cz_1-d}{\sqrt{a^2+b^2+c^2}}$ d. None of these

15. The perpendicular distance from (1 , -1 , 1) to the plane ax + by + cz + d = 0 is

    $a.\frac{a+b+c+d}{\sqrt{a^2+b^2+c^2}}$ b. $\frac{a-b-c-d}{\sqrt{a^2+b^2+c^2}}$ c. $\frac{a-b+c+d}{\sqrt{a^2+b^2+c^2}}$ d. None of these

16. The perpendicular distance from (-1 , 0 , -1) to the plane ax + by + cz + d = 0 is

    $a.\frac{-a+b-c}{\sqrt{a^2+b^2+c^2}}$ b. $\frac{-a-b-c}{\sqrt{a^2+b^2+c^2}}$ c. $\frac{-a-b+d}{\sqrt{a^2+b^2+c^2}}$ d. None of these

17. If the plane (k + 1) x –y + (2 – k) z =5 is perpendicular to the plane 2x + 6y – z + 3 =0 then k =
    a. 1 b. 2 c. 3 d. 4
18. Angle between the planes x + 2y + 3z = 6 and 3x – 2y + z = 1 is
    a. $\frac{\pi}{2}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{6}$
19. The intercepts made on the co-ordinate axes by the plane 2x -4y + 5z = 20 are
    a. 10 , 5 , 4 b. -10 , 5 , 4 c. 10 , -5 , -4 d. 10 , -5 , 4
20. If the line $\frac{x-x_1}{l}=\frac{y-y_1}{m}=\frac{z-z_1}{n}$ is parallel to the plane ax + by + cz + d = 0 then
    a. a/l=b/m=c/n b. $ax_1+by_1+cz_1+d \neq 0$ c. al + bm + cn + d =0 d. both (b) and (c)
21. Equation of the plane containing the line 2x + 3y + 5z – 7 = 0 , 3x – 4y + z +14 = 0 and passing through the origin is
    a. 7x + 2y -11z = 0 b. 7x -2y -11z = 0 c. 7x + 2y + 11z = 0 d. None of these
22. Equation of the line through the point (α,β,γ) and perpendicular to the plane ax + by + cz + d = 0 are
    a. $\frac{x-\alpha}{a}=\frac{y-\beta}{b}=\frac{z-\gamma}{c}$ b. $\frac{x+\alpha}{a}=\frac{y+\beta}{b}=\frac{z+\gamma}{c}$ c. $\frac{x-\alpha}{-a}=\frac{y-\beta}{-b}=\frac{z-\gamma}{-c}$ d. None of these
23. Angles between the lines $\frac{x+2}{-1}=\frac{y+3}{1}=\frac{z-7}{0}$ and $\frac{x}{1}=\frac{y-2}{-2}=\frac{z}{1}$ is

    a. $\frac{\pi}{2}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{6}$

24. The equations of the line x + 2y + 3z = 1 , x + y + 2z = 0 in symmetric form are

    a. $\frac{x+1}{1}=\frac{y+1}{1}=\frac{z}{1}$ b. $\frac{x+1}{1}=\frac{y-1}{1}=\frac{z}{-1}$ c. $\frac{x-1}{1}=\frac{y-1}{1}=\frac{z-1}{-1}$ d. None of these

25. Equations of the straight lines through (2 , 1 , -2) and equally inclined to axes are

    a. x – 2 = y + 1 = z + 2 b. x -2 = y -1 = z – 2 c. x – 2 = y – 1 = z + 2 d. None of these

26. Equations of the line through the origin and having direction cosines 1 , 2 , -3 are

    a. $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ b. $\frac{x}{1}=\frac{y}{2}=\frac{z}{-3}$ c. $\frac{x}{-1}=\frac{y}{-2}=\frac{z}{3}$ d. None of these

27. Acute angle between the lines $\frac{x}{2}=\frac{y}{2}=\frac{z}{1}$ and $\frac{x}{5}=\frac{y}{4}=\frac{z}{-3}$

    a. $\frac{\pi}{2}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{6}$

28. If the lines $\frac{x-1}{-1}=\frac{y+3}{k}=\frac{z-7}{2}$ and $\frac{x+1}{k}=\frac{y}{2}=\frac{z+6}{-3}$ are perpendicular to each other then k =

    a. 6 b. 4 c. 2 d. 1

29. Point of intersection of the line $\frac{x-1}{1} = \frac{y+3}{3} = \frac{z-4}{-2}$ with the plane 3x + 4y + 5z = 6 is

a. (0 , 6 , 6) b.(0 , -6 , 6) c. (0 , -6 , -6) d. None of these

30. Direction cosines of the line whose equations are x + y – z + 1 = 0 , 4x + y – 2z + 2 = 0 are

a. $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}$ b. $\frac{1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}$ c. $\frac{-1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}$ d. $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$

Abstract Algebra

1. A binary operation "* " defined on a set A is commutative if for a , b, £ A j
   a. a *(b * c) = (a*b) * c b. a * b = a c. a * b = b d. a * b = b * a
2. If "*" be a binary operation on N defined by a * b = a – b + ab^2 , then 4 * 5 =
   a. 9 b.88 c. 98 d. 99
3. Let * be a binary operation defined on the set N , then which of the following are both commutative and associative ?
   a. A * b = a+b b. a * b = a-b c. a * b = a^2b d. a * b = ab^2
4. Let " *" be a binary operation defined on the set N. Then which of the following is commutative lent not associative ?
   a. a *b = a-b b. a*b = a+b c. a*b =a.b-4 d. a*b= a.b
5. Let * be a binary operation defined by a*b=2ab Then (a*b) *b=
   a. $4ab^2$ b. $16ab^2$ c. $4a^2b$ d. $16ab^2$
6. If "*" and "~" be two binary operation defined as a*b = ab^2 and a~b = a+2b, then (2*3) ~ (3*4) =
   a. 18 b. 96 c. 114 d. 48
7. Let * be a binary operation defined as a * b = $2.a^b$ + 3 Then 2 * 3 =
   a. 16 b. 19 c. 35 d. 54
8. Which of the following is not a type of binary operation :
   a. Commutative b. associative c. distributive d. transitive
9. If "*" is a binary operation in A, then
   a. A is closed under * b. A is not closed under *,

   c.A is closed under + d. A is closed under-

10. A non empty set A is called as an algebraic structure ……

   a. With respect to binary operation *
   b. With respect to ternary operation
   c. With respect to binary operation +
   d. With respect to unary operation

11.How many properties can hold by a group /

a. 2 b. 3 c. 4 d. 5

12. A group (G,*) is said to ne abelian if

a. x+y = x b. x*y= y *x c. x+y=y d. none

13. { 1,i,-i , -1} is…….

a. semi group   b. sub group   c. cyclic group   d. none

14. The inverse of –i in the multiplicative group { 1, -1 , i , -i } is

a. 1   b. -1   c. i   d. –i

15. Set of all real numbers is not a multiplicative group , since :

a. multiplication is not a binary operation

b. multiplication is not associative

c. identity element does not exist

d. zero has no inverse.

16. If (G, .) is a group , such that $(a.b)^2 = a^2b^2$, $\forall$ a ,b $\in G$ then G is an

a. Commutative semi group   b. Abelian group

c. Non – abelian group   d. None

17. If the binary operation * is defined on a set of ordered of real numbers as

(a , b) * (c , d) = (ad + bc ,bd) and is associative , then (1 , 2) * (2 , 3) * (3 , 4) equal to

a. (34,24)   b. (12 , 24)   c. (46 , 24)   d. None

18. A cyclic group can be generated by a …… elements

a. Singular   b. non-singular   c. inverse   d. None

19. A cyclic group is always …….

a. abelian group   b. semi group   c. Sub group   d. None

20. If (G, .) is a group , such that $(a.b)^{-1} = a^{-1}b^{-1}$, $\forall$ a ,b $\in G$ then G is an

a. Commutative semi group   b. Abelian group

c. Non – abelian group   d. None

21. If (G, .) is a group , such that $a^2 = e$, $\forall$ a $\in G$ then G is an

a. semi group   b. Abelian group

c. Non – abelian group   d. None

22.If (G, .) is a group , the value $(a.b^{-1})^{-1}$ is

a. a.b   b. $a^{-1}.b$ c. $b.a^{-1}$ d. None

23. Let a,b∈z (set of all integers) and an operation "*" defined on z by a *b = a +b + 1 . Then inverse of a is

a. a+2   b. –a -2   c. –a+2   d. a -2

24. Let a, n are any two elements of the set of all real numbers except -1 and a binary operation "*" is defined by a *b = a+b+ab, then inverse of a is

a. $\frac{a}{1+a}$ b. $\frac{a}{1-a}$ c. $\frac{-a}{1+a}$ d.None

25. in a group there must exist at least…

a. one element b. two elements c. three elements d. four elements

26. Does set of residue classes (mod.3) form a group with respect to modular addition?

a. yes b. no c. can't say d. insufficient data

27. Does set of residue classes (mod.3) form a group with respect to modular multiplication?

a. yes b. no c. can't say d. insufficient data

28. What are the elements of the module -3 ring ?

a. {0,1,2,3} b. {0,1,2} c. {1,2,3} d. {-1,0,1,2}

29. The elements of the set of residue class modulo 7 are:

a. { 1,2,3,4,5,6} b. {1,2,3,4,5,6,7} c. {0,1,2,3,4,5,6} d, none

30. A set R with two binary operations called addition and multiplication is said to be a ring if

a. (R,+) is an abelian group

b. closure and associative law for multiplication are satisfied.

c. Distributive law w.r. to addition and multiplication are satisfied

d. all of the anove

31. A non empty set R with two binary operations called addition and multiplication is said to be an integral domain if

a. R is a commutative ring

b. unity element exists in R

c. product of any two non zero elements is non –zero

d. all of the above

32. A set F with two binary operations called addition and multiplication is said to be a field if

a. (F,+) is an abelian group

b. set of non zero elements of F is an abelian group w.r. to multiplication

c. Distributive laws are satisfied in F

d. all of the above

33. Let F= set of numbers of the form a+b $\sqrt{2}$ in the field (F,+,.) the inverse of a +b$\sqrt{2}$ is

a. $\frac{a}{a^2+2b^2} - (\frac{b}{a^2+2b^2})\sqrt{2}$ b. $\frac{a}{a^2-2b^2} - (\frac{b}{a^2-2b^2})\sqrt{2}$

c. $\frac{a}{a^2-2b^2} + (\frac{b}{a^2-2b^2})\sqrt{2}$ c. $\frac{a}{a^2+2b^2} + (\frac{b}{a^2+2b^2})\sqrt{2}$

34. Let M is the set of all numbers of the form a+b $\sqrt{5}$ where a and b are integers. Then M is not a field, because:

a. (M,+) is not abelian group

b. commulative law for multiplication does not hold

c. multiplicative inverse of non – zero element does not exist

d. distributive laws not exist

35. set E of even integers is not an integral domain, because

a. (E,+) is not abelian group

b. unity element does not exists

c. commutative law does not exists

d. absence of zero divisors

<u>Real Analysis</u>

1.The function f : N→ R given by f(x) = x^{n-1} determines ….

a. Geometric sequence b. Arithmetic sequence

c. Harmonic sequence d. Constant sequence

2. The function f : N→ R given by f(x) = { x/2 , if x is even , (1 – x) /2 if x is odd}

determines the sequence

a.-1 , 1 , -2 , 2 …… b. 0 , 1 ,-1 , 2 , -2 ….. c. 1,-1 , 2 , -2 …. d. 0,1 , 2 ,……

3. The sequence (- n) is

a. Bounded b. Bounded below c. Bounded above d. Oscillating

4. Which of the following sequence is a bounded sequence ?

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

5. The sequence { $(-1)^n$} is

a. Unbounded b. Not Bounded above c. Bounded below only d. Bounded

6. The sequence (n) is

a. Bounded b. Bounded below c. Bounded above d. Oscillating

7. The sequence $\{(-1)^n n\}$ is

a. Bounded b. Bounded above c. Bounded below d. Oscillating

8. The least upper bound of the sequence 2/3 ,3/4,4/5,………..(n+1)/(n+2) …….is

a. 2/3 b. -1 c. 0 d. 1

9. Which of the following is true ?

a. A sequence can converges to two different limits.

b. Every convergent sequence is bounded.

c. Every bounded sequence is convergent.

d. Every bounded divergent sequence is divergent .

10. The geometric sequence (r^n) converges if

a. $-1<r<1$ b. $r>1$ c. $r\leq -1$ d. $r = 2$

11. If $r > 1$, the geometric series (r^n) is

a. Convergent b. Divergent c. Oscillate d. Bounded

12. Every convergent sequence is …… sequence

a. unbounded b. Cauchy c. Monotonic d.None

13.Any Cauchy sequence in ………. Is convergent

a. N b. Q c. R d. Z

14. $\lim_{x\to\infty}\frac{1}{x^2}$ is

a. 0 b. 2 c. 1 d. ∞

15. $\lim_{x\to\infty}\frac{1+2+3+\cdots\ldots n}{x^2}$ is

a. 0 b. 1 c. 1/2 d. 2

16. $\lim_{x\to\infty}(1+\frac{1}{x})^n =$ is

a. 0 b. 1 c. e d. 2

17. Every convergent sequence is

a. Null sequence b. divergent sequence

c. convergent sequence d. oscillating

18. The sequence {1,2,3,4,….} is

a. Not Convergent but bounded b. Convergent but unbounded

c. Both divergent and unbounded d. Convergent but is not unbounded

19. The sequence ½ , $½^2$, $½^3$, ……… $1/2^n$,……… converges to

a. 0 b. 1 c. ½ d. ∞

20. What is the limit of the sequence

{ 3,2,5/3,6/4,7/5,………..}

a. 3 b. 1 c. ∞ d. 0

21. Every monotonic increasing sequence is ……….

a. Bounded above b. Bounded Below c. Bounded d. Convergent

22. Every monotonic decreasing sequence is ……….

a. Bounded above b. Bounded Below c. Bounded d. Convergent

23. A monotonic decreasing sequence which is not bounded below

a. Converges to its lub b. diverges to ∞

c. Converges to its glb b. diverges to $-\infty$

24. The infinite series $\sum \frac{1}{n^p}$ is convergent when

a. p <1 b. p=1 c. p> 1 d. none of the above

25. The infinite series $\sum \frac{1}{n^p}$ is divergent when

a. p <1 b. p=1 c. both a and b d. p >1

26. If $\lim_{n\to\infty} \frac{u_n}{v_n} =$ a finite non – zero number then

a. $\sum u_n$ is a convergent and $\sum v_n$ is divergent

b. $\sum u_n$ and $\sum v_n$ both are convergent

c. $\sum u_n$ and $\sum v_n$ both are divergent

d. Either a or b

27. Let $\sum u_n$ be an infinite series of positive terms , such that $\lim_{n\to\infty} \frac{u_n}{u_{n+1}} = l$, then

the series $\sum u_n$ is convergent when

a. $l > 1$ b. $l < 1$ c. $l = 1$ d. None

28. Let $\sum u_n$ be an infinite series of positive terms , such that $\lim_{n\to\infty} u_n^{\frac{1}{n}} = l$, then

the series $\sum u_n$ is divergent when

a. $l < 1$ b. $l > 1$ c. $l = 1$ d. None of these

29. The series 2-2+2-2+2-2+……… is

a. Convergent b. Divergent c. Oscillates d. None of these

30. The series $\frac{1}{\sqrt{1}} + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \cdots \dots \dots . \frac{1}{\sqrt{n}} + \cdots \dots . is\ a$

a. Convergent series b. Divergent series c. Oscillating series d. either a or b

31. The series $\frac{1}{1^{\pi}} + \frac{1}{2^{\pi}} + \frac{1}{3^{\pi}} + \cdots \dots \dots . \frac{1}{n^{\pi}} + \cdots \dots . is\ a$

a. Convergent series b. Divergent series c. Oscillating series d. either a or b

32. The series $1 + \frac{x}{2} + \frac{x^2}{3^2} + \frac{x^3}{4^3} + \cdots \dots \dots . \dots \dots . (\ n > 0) is\ a$

a. Convergent series b. Divergent series c. Oscillating series d. None

33. The series $1 + \frac{1+2}{1+2^2} + \frac{1+3}{1+3^2} + \cdots \dots \dots . \dots + \frac{1+n}{1+n^2} \dots . (\ n > 0) is\ a$

a. Convergent series b. Divergent series c. Oscillating series d. None

34. The series $\frac{1}{4} + \frac{1.3}{4.7} + \frac{1.3.5}{4.7.10} + \cdots \dots \dots . \dots \dots . is\ a$

a. Convergent series b. Divergent series c. Oscillating series d. None

35. The series $1 + \frac{2^p}{2!} + \frac{3^p}{3!} + \cdots \dots \dots . \dots \dots$ for all values of p is

a. Convergent series b. Divergent series c. Oscillating series d. None

36. The series 2x $+ \frac{3x^2}{8} + \frac{4x^3}{27} + \cdots \dots \dots . \dots \frac{(n+1)x^n}{n^3} \dots .\ \ to\ \infty$ is

a. Convergent when x > 1 and divergent when x < 1

b. Convergent when x > 1 and divergent when x = 1

c. Convergent when x = 1 and divergent when x > 1

d. Convergent when x $\leq$ 1 and divergent when x > 1

37.The series $\sum_{x=1}^{\infty} \frac{x^n}{1+x^2}$ for all x > 0 is

a. Convergent when x > 1 and divergent when x < 1

b. Convergent when x = 1 and divergent when x < 1

c. Convergent when x $\leq$ 1 and divergent when x > 1

d. None of these

38. The series $1-\frac{1}{2}+\frac{1}{3}-\frac{1}{4}+\cdots \ldots \ldots . \ldots \ldots . \quad is$ is

a. Convergent b. absolutely convergent c. Divergent d. None of these

39. The series $1-\frac{1}{2^2}+\frac{1}{3^3}-\cdots \ldots \ldots . \ldots \ldots . \quad is$ is

a. Convergent b. absolutely convergent c. Divergent d. None of these

40. A function f(x) define over an interval I is said to be continuous at x = a $\in I$

if $\lim_{x \to a} f(x) =$

a. a b. |a| c. f(a) d. – f(a)

41. Which is incorrect among the following statements

a. If f(x) is continuous at x = a , then the value of limit of f(x) at x = a exists and finite

b. If f(x) is continuous at a point , then it is differentiable at that point

c. If f(x) is differentiable at a point then it must be continuous at that point.

d. If f(x) is differentiable at a point , then there must exists a limiting value of

f(x) at that point,

42. If f(x) = $x^2 \sin\frac{1}{x}$, for x$\neq$ 0 and f(0) = 0 then at x =0 , the function is

a. Continuous and differentiable

b. Continuous but not differentiable

c. Differentiable but not continuous

d. None

43. If f(x) = { $\frac{\sin x}{x}$ $, x \neq 0 \; and \; 2 \, , x = 0$ }

a. $\lim_{x \to 0^+} f(x) > \lim_{x \to 0^-} f(x)$

b. $\lim_{x \to 0^+} f(x) = \lim_{x \to 0^-} f(x)$

c. $\lim_{x \to 0^+} f(x) < \lim_{x \to 0^-} f(x)$

d. None of these

44. If f(x) = { x , 0$\le x < \frac{1}{2}$ $and\ 1-x, \frac{1}{2} \le x < 1$ } then $\lim_{x \to \frac{1}{2}} f(x)$

a. 1 b. ½ c. 0 d. -1

45. If f(x) = x $\sin\frac{1}{x}$, for x$\neq$ 0 and f(0) = 0 then $\lim_{x \to 0} f(x) =$

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