English

1.

If a sequence $\{a_n\}$ is bounded and monotonic then it is

(A) Convergent

(B) divergent

(C) oscillatory

(D) periodic

Correct Option(s): A

English

2.

If f(x) is a continuous function on [a, b] then it attains

(A) No maximum

(B) only minimum

(C) both maximum and minimum

(D) only maximum

Correct Option(s): C

English

3.

A series $\sum \frac{1}{n^p}$ is convergent if

(A) $p \leq 1$

(B) $p \geq 1$

(C) $p < 1$

(D) $p > 1$

Correct Option(s): D

English

4.

The complex analytic function f(x) with the imaginary part $(y \cos y + x \sin y)$ is

(A) ze^{z+c}

(B) $(z+c)e^2$

(C) ze^z

(D) $(z^2+z)e^{z^2+z}$

Correct Option(s): C

English

5.

In a ring, an element 'a' is called a unit if

(A) $a^2 = a$

(B) a has a multiplicative inverse

(C) a is zero

(D) $a^2 = 0$

Correct Option(s): B

English

6.

The function f(z)=tan z has

(A) Poles at z=(2n+1) $\frac{\pi}{2}$, n$\in Z$

(B) an entire function

(C) No zeros in C

(D) a removable singularity at z=0

Correct Option(s): A

English

7.

Let $u(x, y) = x^3 - 3xy^2 + 2x$. For which of the following functions v is $u + iv$ a holomor function on C?

(A) $v(x, y) = y^3 - 3x^2y + 2y$

(B) $v(x, y) = 3x^2y - y^3 + 2y$

(C) $v(x, y) = x^3 - 3xy^2 + 2x$

(D) $v(x, y) = 0$

Correct Option(s): B

English

8.

The Set of discontinuities of a monotone function on $\mathbb{R}$ is

(A) Countable

(B) Uncountable

(C) Finite

(D) Uncountable

Correct Option(s): A

English

9.

The row space of a 20 ×50 matrix A has dimension 13. What is the dimension of the space of Solutions of $Ax = 0$?

(A) 7

(B) 13

(C) 33

(D) 37

Correct Option(s): D

English

10.

. Let V be the vector space of all 5×5 real skew symmetric matrices. Then the dimension of V is

(A) 20

(B) 15

(C) 10

(D) 5

Correct Option(s): C

English

11.

Let P be a 2×2 complex matrix such that $P * P$ is the identity matrix, where P^* is The conjugate transpose of P. Then the Eigen values of P are

(A) Real

(B) complex conjugate of each other

(C) Reciprocal of each other

(D) of modulus 1

Correct Option(s): D

English

12.

The matrix $\begin{bmatrix} 3 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$ is

(A) Positive definite

(B) Non negative definite but not positive definite

(C) Negative definite

(D) Neither negative nor positive definite

Correct Option(s): A

English

13.

The residue of $f(z) = \frac{1}{z^2(z-1)}$ at $z = 0$ is

(A) 0

(B) 1

(C) -1

(D) Undefined

Correct Option(s): A

English

14.

The contour integral of an analytic function over a closed curve is

(A) 0

(B) 1

(C) Equal to the sum of residues

(D) Depends on the curve

Correct Option(s): A

English

15.

The solution of $y' = y$ with the initial condition $y(0) = 1$ is

(A) $y = e^x$

(B) $y = x$

(C) $y = 1$

(D) $y = e^{-x}$

Correct Option(s): A

English

16.

If $y_1(x)$ and $y_2(x)$ are two solutions of a linear homogeneous ODE, then their wronskian is

(A) Zero

(B) constant

(C) Non Zero

(D) variable

Correct Option(s): C

English

17.

The method of variation of parameters is used to find

(A) Particular solution

(B) General solution

(C) Feasible solution

(D) Optimal Solution

Correct Option(s): A

English

18.

The relation $z = (x + a)(y + b)$ represents the partial differential equation

(A) $z = \frac{p}{q}$

(B) $z = pq$

(C) $z = p - q$

(D) $z = p + q$

Correct Option(s): B

English

19.

The solution of $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = \frac{z}{a}$ is

(A) $z = e^{\frac{y}{a}} f(x - y)$

(B) $z = e^{\frac{y}{a}} f(x)$

(C) $z = e^{y} f(y)$

(D) $z = e^{x} f(x + y)$

Correct Option(s): A

English

20.

The solution derived from complete primitive by giving values to arbitrary constants is

(A) Single solution

(B) Particular integral

(C) Complete solution

(D) Definite integral

Correct Option(s): B

English

21.

What is the order of the differential equation, derived from $y = Ae^{2x} + Be^{-2x}$? Here A, B are arbitrary constants.

(A) 3

(B) 2

(C) 1

(D) 0

Correct Option(s): B

English

22.

The integral $\varepsilon \int_a^b \left(t\frac{\partial F}{\partial s} - \frac{dt}{dx}\frac{\partial F}{\partial s'}\right) dx$, where $y = s(x), t = t(x)$ and $F = F(x, y, y')$ is referred as

(A) First variation

(B) Second variation

(C) Third variation

(D) Fourth variation

Correct Option(s): A

English

23.

In the group {1, 2, 3,....., 16} under the operation of multiplication modulo 17, the order of the element 3 is

(A) 4

(B) 8

(C) 12

(D) 16

Correct Option(s): D

English

24.

. The number of group homomorphisms from the symmetric group S_3 to the additive group $\frac{Z}{6Z}$ is

(A) 1

(B) 2

(C) 3

(D) 0

Correct Option(s): B

English

25.

The number of conjugacy classes in the permutation group S_6 is

(A) 12

(B) 11

(C) 10

(D) 6

Correct Option(s): B

English

26.

For any group G of order 36 and any subgroup H of G order 4

(A) $H \subset Z(G)$

(B) $H = Z(G)$

(C) H is normal in G

(D) H is an abelian group

Correct Option(s): D

English

27.

Let G be a group and let $a \in G$. If $o(a) = n$ and k is any integer, then which one of the follo Correct?

(A) $o(a^k) > n$ Only

(B) $o(a^k) \geq n$

(C) $o(a^k) < n$ only

(D) $o(a^k) \leq n$

Correct Option(s): D

English

28.

Let I be any ideal in the ring z of integers Then

(A) I can be generated by one element

(B) $I = \langle 0 \rangle \; or \; I = Z$

(C) There is an ideal I' such that $I \oplus I' = z$

(D) I is generated by a prime number

Correct Option(s): A

English

29.

Let G be a simple group of order 168. What is the number of subgroups of G of order 7?

(A) 1

(B) 7

(C) 8

(D) 28

Correct Option(s): C

English

30.

The number of abelian groups of order 108 is

(A) 12

(B) 9

(C) 6

(D) 5

Correct Option(s): C

English

31.

Let R be the ring $z[x]/< (x^2 + x + 1)(x^3 + x + 1) >$ what is the cardinality of the ring R?

(A) 27

(B) 32

(C) 64

(D) Infinite

Correct Option(s): D

English

32.

The number of subfields of a field of cardinality 2^{100} is

(A) 2

(B) 4

(C) 9

(D) 100

Correct Option(s): C

English

33.

Backward differences is defined as

(A) $\nabla f(x) = -f(x-h)$

(B) $\nabla f(x) = f(x) + f(x-h)$

(C) $\nabla f(x) = f(x) - f(x-h)$

(D) $\nabla f(x) = f(x-h)$

Correct Option(s): C

English

34.

Which of the following relation is true?

(A) $E^n \equiv (1-\Delta)^n$

(B) $E^2 \equiv 1+\Delta$

(C) $\Delta \equiv E-1$

(D) $\Delta \equiv E+1$

Correct Option(s): C

English

35.

Shifting the origin in Gauss's backward formula one have

(A) String's formula

(B) Bessel's formula

(C) Everett's formula

(D) Newton's formula

Correct Option(s): B

English

36.

In Newton's cotes formula, if *f(x)* is interpolated at equally spaced nodes by a polynomial of Degree two then it represents

(A) Trapezoidal rule

(B) Simpson rule

(C) Three-eight rule

(D) Boole's rule

Correct Option(s): B

English

37.

Given the function $F = F(x, y, y')$, the differential equation $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$, is referred as

(A) Euler's characteristic equation

(B) Lagrange's equation

(C) Hamilton equation

(D) Differential equation

Correct Option(s): A

English

38.

. The integral $\frac{\varepsilon}{2!}\int_a^b \left(t^2\frac{\partial^2 F}{\partial s^2} - 2tt'\frac{\partial^2 F}{\partial s \partial s'} + t^{12}\frac{\partial^2 F}{\partial s^{12}}\right)dx$, where $y = s(x), t = t(x)$ and $F = F(x, y, y')$ is referred as

(A) First variation

(B) Second variation

(C) Third variation

(D) Fourth variation

Correct Option(s): B

English

39.

A kernel $K(x, y)$ which is quadratically integrable in the square $(0 \leq x \leq h, 0 \leq y \leq h)$ is referred as

(A) $L_1 - kernel$

(B) $L_2 - kernel$

(C) $L_3 - kernel$

(D) $L_4 - kernel$

Correct Option(s): B

English

40.

The equation $\int_0^x \frac{\varphi(y)}{(x-y)^\alpha}dy = f(x), (0 < \alpha < 1)$ is referred as

(A) Fredholm equation

(B) Able equation

(C) Maxwell equation

(D) Picard's equation

Correct Option(s): B

English

41.

The solution to Able's equation is given by

(A) $\varphi(x) = \frac{sin\alpha\pi}{\pi}$

(B) $\varphi(x) = \frac{sin\alpha\pi}{\pi}\left[\frac{f(0)}{x^{1-\alpha}} + \int_0^x \frac{f'(y)}{(x-y)^{1-\alpha}}dy\right]$

(C) $\varphi(x) = x$

(D) $\varphi(x) = sinx$

Correct Option(s): B

English

42.

A Volterra integral equation has

(A) One eigen values

(B) Two eigen values

(C) Three eigen values

(D) No eigen values

Correct Option(s): D

English

43.

The kernel is symmetric if

(A) $k(x,y) = k(y,x)$

(B) $k(x,y) > k(y,x)$

(C) $k(x,y) < k(y,x)$

(D) $k(x,y) \leq k(y,x)$

Correct Option(s): A

English

44.

. Equation of constraints that does not contain time as explicit variable are referred as

(A) Holonomic constraints

(B) Rheonomous constraints

(C) Non-holonomic constraints

(D) Scleronomous constraints

Correct Option(s): D

English

45.

Hamiltonian Function is

(A) $H = L \sum_k p_k q_k$

(B) $H = \sum_k p_k q_k - L$

(C) $H = \sum_k p_k q_k + L$

(D) $H = \sum_k p_k q_k \; L$

Correct Option(s): B

English

46.

. What is the probability to get two aces in succession (with replacement) from a deck of 52 cards?

(A) $\frac{1}{52}$

(B) $\frac{2}{169}$

(C) $\frac{2}{159}$

(D) $\frac{1}{169}$

Correct Option(s): D

English

47.

For the random variable X, which has the probability function $f(x) = \frac{k}{x!}(x = 0,1,2, \dots)$ the distribution function is

(A) Ke

(B) $\frac{k}{e}$

(C) e

(D) $k+e$

Correct Option(s): A

English

48.

If X has the probability density

$f(x)\begin{cases} e^{-x} & x > 0 \\ 0 & otherwise \end{cases}$ and $g(X) = e^{3X/4}$ What is the expected value of g(X)?

(A) 4

(B) 3

(C) 2

(D) 1

Correct Option(s): A

English

49.

. If a feasible solution of linear programming problem exist, then the region of feasible solution is

(A) Convex set

(B) Connected set

(C) Non-convex set

(D) Non-connected set

Correct Option(s): A

English

50.

If rate of birth is 12 per minute, then the average number of birth per year is

(A) 43,800

(B) 45,000

(C) 40,000

(D) 42,000

Correct Option(s): A