

FINAL ANSWER KEY

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Question1:-Who was the first non-brahmin, who rang the temple bell of Guruvayoor as a part of Guruvayoor Sathyagraha ?

- A:-K. Kelappan
- B:-Mannathu Padmanabhan
- C:-P. Krishna Pillai
- D:-T.K. Madhavan

Correct Answer:- Option-C

Question2:-The weekly 'Vivekodayam' was published under the leadership of :

- A:-Kumaranasan and M. Govindan
- B:-Kumaranasan and Dr. Palppu
- C:-Kumaranasan and Sahodaran Ayyappan
- D:-Kumaranasan and C. Kesavan

Correct Answer:- Option-A

Question3:-Among the following members who participated in Civil Disobedience Movement holding her two months old daughter in her arms ?

- A:-Parvathi Nenmenimangalam
- B:-A.V. Kuttimalu Amma
- C:-Sarojini Naidu
- D:-Akkamma Cheriyan

Correct Answer:- Option-B

Question4:-The book 'Sivasadakam' written by :

- A:-Chattambi Swamikal
- B:-Vagbhadananda
- C:-Brahmananda Sivayogical
- D:-Sreenarayana Guru

Correct Answer:- Option-D

Question5:-The book 'Boheemiyam Chithrangal' written by :

- A:-S.K. Pottakkad
- B:-Malayattoor Ramakrishnan
- C:-Sanjayan
- D:-P.C. Kuttikrishnan

Correct Answer:- Option-A

Question6:-Among the following which is included in the World Heritage Table in 2016 from India ?

- A:-Kasiranga wildlife sanctuary
- B:-Rani ki Vav
- C:-Kanjana national park
- D:-Greater Himalayan national park

Correct Answer:- Option-C

Question7:-Kilkari project related to :

- A:-a project to control sound pollution
- B:-a sms based information system of police
- C:-a mobile voice message service related to family health care
- D:-a project to control child labour

Correct Answer:- Option-C

Question8:-Mistake in news reading is known as :

- A:-false reading
- B:-Ident
- C:-ill lexibility
- D:-fluff

Correct Answer:- Option-D

Question9:-The narrow stretch of land that connect Peninsular India with north-eastern states of India :

- A:-Sikkim Corridor
- B:-Darjiling Corridor
- C:-Gangtok Corridor
- D:-Siliguri Corridor

Correct Answer:- Option-D

Question10:-Which article of Indian Constitution deals about money bill ?

- A:-Article - 110
- B:-Article - 109
- C:-Article - 120
- D:-Article - 118

Correct Answer:- Option-A

Question11:-'Applying a principle in a new situation' is an example for :

- A:-Inquiry objective
- B:-Conceptual objective
- C:-Affective objective
- D:-Skill objective

Correct Answer:- Option-B

Question12:-Hypothetico-deductive thinking is a characteristic in :

- A:-Early childhood
- B:-Later childhood
- C:-Infancy
- D:-Adolescence

Correct Answer:- Option-D

Question13:-The correlation between intelligence and achievement :

- A:-High correlation
- B:-Moderate correlation
- C:-Low correlation
- D:-No correlation

Correct Answer:- Option-A

Question14:-Which of the following is an expository method of teaching ?

- A:-Project method
- B:-Assignment method
- C:-Lecture method
- D:-Problem solving method

Correct Answer:- Option-C

Question15:-Grading using relative performance of students in a group is :

- A:-Direct grading
- B:-Absolute grading
- C:-Criterion referenced grading
- D:-Norm referenced grading

Correct Answer:- Option-D

Question16:-The purpose of pure research is :

- A:-To generate new theories and principles
- B:-To apply generated knowledge in new situation
- C:-To solve an immediate problem
- D:-To predict a future problem

Correct Answer:- Option-A

Question17:-Which is the correct sequence in research ?

- A:-Observation-Verification-Hypothesizing-Theory making
- B:-Hypothesizing-Observation-Theory making-Verification
- C:-Observation-Hypothesizing-Verification-Theory making
- D:-Hypothesizing-Observation-Verification-Theory making

Correct Answer:- Option-C

Question18:-Internal validity in experimental research means :

- A:-Genuineness of experimental treatment
- B:-Culture free treatment
- C:-Generalisability to other experimental settings
- D:-Random selection of experimental group

Correct Answer:- Option-A

Question19:-Impact factor of a research paper is :

- A:-Article cataloging system
- B:-Quality indicator of the article
- C:-Journal identifying mechanism
- D:-Licensing of journals

Correct Answer:- Option-B

Question20:-The process of getting permission from the subjects before conducting a research is :

- A:-Research honesty
- B:-Clinical trial
- C:-Objectivity in research
- D:-Informed consent

Correct Answer:- Option-D

Question21:-Which Constitution Amendment Act has substituted, in Clause (4A) of Article 16 of the Constitution of India, for the words "in matters of promotion to any class" the words "in matters of promotion, with consequential seniority, to any class" ?

- A:-The Constitution `77^(th)` Amendment Act
- B:-The Constitution `85^(th)` Amendment Act
- C:-The Constitution `83^(rd)` Amendment Act
- D:-The Constitution `92^(nd)` Amendment Act

Correct Answer:- Option-B

Question22:-_____ is not legally enforceable by any court and the state cannot be compelled through the courts to implement them.

- A:-Directive principles of State Policy
- B:-Fundamental Rights
- C:-Fundamental Duties
- D:-Right to Education

Correct Answer:- Option-A

Question23:-Who said "Preamble is the 'Political Horoscope' of the Constitution" ?

- A:-Justice V.R. Krishna Iyer
- B:-Justice K.T. Thomas
- C:-K.M. Munshi
- D:-Nani A. Palkhivala

Correct Answer:- Option-C

Question24:-The article, which is related with the Residuary Powers of the Indian Parliament is :

- A:-Article 370
- B:-Article 268
- C:-Article 248
- D:-Article 356

Correct Answer:- Option-C

Question25:-Which article of the Indian Constitution empowers the President of India to declare National Emergency ?

- A:-Article 360
- B:-Article 356
- C:-Article 350
- D:-Article 352

Correct Answer:- Option-D

Question26:-Who appoints State Chief Information Commissioner and Other Information Commissioners ?

- A:-Governor
- B:-President
- C:-Chief Justice of India
- D:-Prime Minister

Correct Answer:- Option-A

Question27:-Commission for Protection of Child Rights Act, 2005 provides that Chairman and other members of National Commission for Protection of Child Rights shall hold office as such for a period of _____ from the date on which he assumes the office.

- A:-2 Years
- B:-3 Years
- C:-5 Years
- D:-4 Years

Correct Answer:- Option-B

Question28:-The day, on which The National Food Security Act, 2013 received the assent of the President of India is :

- A:-`10^(th)` September, 2013
- B:-`24^(th)` September, 2013
- C:-`17^(th)` September, 2013
- D:-`28^(th)` September, 2013

Correct Answer:- Option-A

Question29:-In the year 1986 which of the following Acts was enacted by the Parliament of India for the protection and improvement of environment ?

- A:-The Air (Prevention and Control of Pollution) Act
- B:-The Environment (Protection) Act
- C:-The Water (Prevention and Control of Pollution) Act
- D:-The National Environment Tribunal Act

Correct Answer:- Option-B

Question30:-In which year National Rural Employment Guarantee Act is renamed as Mahatma Gandhi National Rural Employment Guarantee Act ?

- A:-2005
- B:-2010
- C:-2009
- D:-2012

Correct Answer:- Option-C

Question31:-Find a simpler expression for $S \cup ((\overline{R \cup S}) \cap R)$ where S and R are any two sets and U is the Universal Set.

- A:-S
- B:-R
- C:-U
- D:-`phi`

Correct Answer:- Option-C

Question32:-Fibonacci number `f_n=f_(n-1)+f_(n-2)` where `f_1=1` and `f_2=1` is even if n is divisible by ``

- A:-2
- B:-3
- C:-multiples of 2
- D:-None of these

Correct Answer:- Option-B

Question33:-If x, y and z are three elements in a Boolean algebra such that `x=yz^1+y^1z`,` then write an expression for `x^1`.

- A:-`(y+z) (y^1+z^1)`
- B:-`yz+y^1 z^1`
- C:-`y^1+z^1`
- D:-None of these

Correct Answer:- Option-B

$$f(x) = \sqrt{\frac{1-|x|}{|x|-2}}$$

Question34:-The domain of the function is :

- A:-(-`oo`, - 1) `uu` (1, `oo`)
- B:-(-`oo`, - 2) `uu` (2, `oo`)
- C:-(- 2, - 1) `uu` (1, 2)
- D:-None of these

Correct Answer:- Option-C

Question35:-The number of vertices of a 2-regular graph with 16 edges is :

- A:-16
- B:-32
- C:-8
- D:-`16^2`

Correct Answer:- Option-A

Question36:-Which of the following is not true `K_3`,`_3` is a :

- A:-Bipartite graph
- B:-Complete graph
- C:-Cubic graph
- D:-3 regular graph

Correct Answer:- Option-B

Question37:-For any vector space V which of the following set is a subspace having a single element :

A:-{0}

B:-{ ϕ }

C:- ϕ

D:-{0}

Correct Answer:- Option-A

Question38:-What is the largest possible value for the rank of a 2×5 matrix ?

A:-10

B:-5

C:-3

D:-None of these

Correct Answer:- Option-D

Question39:-If atleast two elements a, b other than identity element are such that $o(a) = \text{finite}$ and $o(b) = \infty$, then the group is called :

A:-Torsion free group

B:-Torsion group

C:-Mixed group

D:-P-group

Correct Answer:- Option-C

Question40:-Which of the following pair of groups are isomorphic ?

A:- $\mathbb{Z}_{(24)}$ and $\mathbb{Z}_8 \oplus \mathbb{Z}_3$

B:- $\mathbb{Z}_{(25)}$ and $\mathbb{Z}_5 \oplus \mathbb{Z}_5$

C:- $\mathbb{Z}_{(24)}$ and $\mathbb{Z}_5 \oplus \mathbb{Z}_5$

D:- $\mathbb{Z}_{(20)}$ and $\mathbb{Z}_2 \oplus \mathbb{Z}_{10}$

Correct Answer:- Option-A

Question41:-The point on the plane curve $f(x) = -x^3 + 3x + 9x - 12$ where the slope of the tangent is maximum is :

A:-(-2, -12)

B:-(-1, 1)

C:-(-1, -1)

D:-None of these

Correct Answer:- Option-D

Question42:-The quadratic equation whose roots are the squares of the roots of the equation $2x^2 - 2x + 5 = 0$ is :

A:- $4x^2 + 4x + 25 = 0$

B:- $4x^2 + 16x + 25 = 0$

C:- $4x^2 - 4x - 25 = 0$

D:- $16x^2 - 4x - 25 = 0$

Correct Answer:- Option-B

Question43:-If the sum of the distances of a point in the plane from two fixed perpendicular lines is l, then the locus of the point is :

A:-Ellipse

B:-Hyperbola

C:-Square

D:-Parabola

Correct Answer:- Option-C

Question44:-The directional derivative of the scalar function $2xy + z^2 + 1$ in the direction of the vector $i + 2j - k$ at the point $(1, -1, 2)$ is :

A:-3

B:- $15/2$

C:-0

D:-1

Correct Answer:- Question Cancelled

Question45:-The product of the eigen values of the matrix $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ is :

A:-5

B:-1

C:-4

D:-None of these

Correct Answer:- Option-A

Question46:-If $f(x) = (\ln(\sin 2x))^2$ then $f'(x)$ is :

A:- $4 \cot 2x$

- B:-2 tan 2x
- C:-2 cot 2x. ln(sin 2x)
- D:-None of these

Correct Answer:- Option-D

Question47:-The ratio of the diameter of a sphere to the height of the right circular cone having the greatest volume which can be inscribed in the sphere is :

- A:-3 : 2
- B:- $\sqrt{3} : 2 \sqrt{2}$
- C:-4 : 3
- D:-2 : 1

Correct Answer:- Option-A

Question48:-The dimension of the dual space of the vector space of 2×2 matrices with complex entries, over the field of real numbers is :

- A:-3
- B:-8
- C:-0
- D:-1

Correct Answer:- Option-B

Question49:-If f is a non-zero linear functional defined on a three dimensional vector space X , then the dimension of the null space of f is :

- A:-3
- B:-2
- C:-1
- D:-None of these

Correct Answer:- Option-B

Question50:-Which of the following is **not** a Hilbert space ?

- A:- $C[0, 1]$
- B:- $L^2[0, 1]$
- C:- l^2
- D:-None of these

Correct Answer:- Option-A

Question51:-Let $\{x_n\}$ be a convergent sequence in \mathbf{R} , the set of real numbers. Then the number of limit points of $\{x_n\}$ is :

- A:-Exactly one
- B:-Exactly one if \mathbf{R} is under usual topology
- C:-There is no limit for limit points
- D:-Cannot say

Correct Answer:- Option-B

Question52:-For what values of 'a' the function :

$f(x) = x^2 + a, x < 2$
 $= 2a - x^2, x \geq 2$ is continuous at every x .

- A:-a = 0
- B:-a = 2
- C:-a = 8
- D:-a = 4

Correct Answer:- Option-C

Question53:-If a real valued function f is defined and continuous on a closed and bounded set F of real numbers, then :

- A:- f is a constant
- B:- f is not differentiable on F
- C:- f is measurable
- D:- f is uniformly continuous on F

Correct Answer:- Option-D

Question54:-Let f be a family of measurable real functions. Let G be the set of limit points of sequences of real functions in f . Then G is :

- A:-measurable
- B:-non-measurable
- C:-countable
- D:-none of the above

Correct Answer:- Option-A

Question55:-Let $f : \mathbb{R} \rightarrow \mathbb{R}$ is differentiable for every $x \in \mathbb{R}$, such that $\lim_{(x \rightarrow \infty)} f'(x) = \frac{1}{2}$. Then $\lim_{(x \rightarrow \infty)} \frac{f(x)}{x}$ is :

A:-0

B:- $\frac{1}{2}$

C:- $\frac{1}{2}$

D:- ∞

Correct Answer:- Option-C

Question56:-Let t be a positive integer and define a sequence $\{x_n\}$ by $x_{(n+1)} = t + \frac{x_n^2}{n}$ for all $n \geq 0$ with $x_0 = 0$. If the sequence is convergent, then :

A:- $t = 1/4$

B:- $t > 1/4$

C:- $t < 1/4$

D:- $t < (-1)/(4)$

Correct Answer:- Option-A

Question57:-Find the number of continuous onto maps from $[0, 1]$ to $(0, 1)$.

A:-Countably many

B:-None

C:-Exactly one

D:-Uncountably many

Correct Answer:- Option-B

Question58:-Let $f(x) = a_1 \sin x + a_2 \sin 2x + \dots + a_n \sin nx$ such that $|f(x)| \leq |\sin x| \forall x \in \mathbb{R}$. Then $|a_1 + 2a_2 + \dots + na_n|$ is :

A:-cannot find

B:-0

C:-greater than $(n(n+1))/2$

D:-less than or equal to 1

Correct Answer:- Option-D

Question59:-Let $\{S_n\}$ be a sequence of real numbers defined by $S_1 = \sqrt{2}$ and $S_{(n+1)} = \sqrt{2 + S_n}$, then $\{S_n\}$ is :

A:-Monotonically increasing for all n

B:-Monotonically decreasing for all n

C:-Monotonically increasing for even n and decreasing for odd n

D:-Neither increasing nor-decreasing

Correct Answer:- Option-A

Question60:-Let f be a function on real line such that $|f|$ is measurable. Then :

A:- f is measurable if it is monotonically increasing

B:- f is always measurable

C:- f need not be measurable

D:-none of the above

Correct Answer:- Option-C

Question61:-The value of $\int_C z^{-1/2} dz$, where C is the curve $|z - i| = 1/2$, is :

A:- πi

B:-0

C:- $2\pi i$

D:- $-1/\pi^3$

Correct Answer:- Option-B

Question62:-Which of the following is a bounded complex valued function :

A:- $f(z) = \sin z$, in the complex plane

B:- $f(z) = e^{z/z}$, in the complex plane with $|z| > 0$

C:- $f(z) = \cosh z$, in the complex plane

D:-None of the above (A), (B) and (C)

Correct Answer:- Option-D

Question63:-The function $g(z) = \frac{z}{(e^z - 1)}$, $z \neq 0$, has :

A:-Essential singularity at $z = 1$

B:-Pole at the origin

C:-Essential singularity at the origin

D:-Removable singularity at the origin

Correct Answer:- Option-D

$$\int_{|z|=1} |z-1| |dz|$$

Question64:-Which of the following is the value of $\int_{|z|=1} |z-1| |dz|$:

- A:-1
- B:-2`Pi`i
- C:-8
- D:-10

Correct Answer:- Option-C

Question65:-The number of roots of $z^4-6z+3=0$, with absolute value less than 1 is :

- A:-4
- B:-1
- C:-0
- D:-3

Correct Answer:- Option-B

Question66:-If \mathbf{R} is the set of real numbers, then which of the following is a metric on $\mathbf{R} \times \mathbf{R}$.

For $X = (x_1, y_1)$ and $Y = (x_2, y_2)$ in $\mathbf{R} \times \mathbf{R}$.

- A:- $d(X, Y) = \text{Max} \{ |x_1-y_1|, |x_2-y_2| \}$
- B:- $d(X, Y) = |x_1-x_2|$
- C:- $d(X, Y) = \sqrt{(x_1-y_1)^2+(x_2-y_2)^2}$
- D:- $d(X, Y) = \frac{\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}}{(1+\sqrt{(x_1-x_2)^2+(y_1-y_2)^2})}$

Correct Answer:- Option-D

Question67:-If (X, d) is an arbitrary metric space and E is a subset of X , choose the false statement from the following.

- A:-Every interior point of E is a limit point of E
- B:-The largest open set contained in E can be a closed set
- C:-The closure of E can be an open set
- D:-Every limit point of E is the limit of a sequence in E

Correct Answer:- Option-A

Question68:-Let \mathbf{R} be the set of real numbers and \mathfrak{T} be the semi open interval topology on \mathbf{R} . Then, which of the following is true for $(\mathbf{R}, \mathfrak{T})$.

- A:- $(\mathbf{R}, \mathfrak{T})$ is a second countable space.
- B:- $(\mathbf{R}, \mathfrak{T})$ is a metrizable space.
- C:- $(\mathbf{R}, \mathfrak{T})$ is a separable space.
- D:- $(\mathbf{R}, \mathfrak{T})$ is a compact space.

Correct Answer:- Option-C

Question69:-Choose the correct statement from the following :

- A:- $[0, 1]$ is homeomorphic to the unit circle S^1 , both have subspace topologies of the usual topologies of \mathbf{R} and $\mathbf{R} \times \mathbf{R}$ respectively.
- B:- $\{[a, b] : a \in \mathbf{R}, b \in \mathbf{R}, a < b\}$ is a base for a topology on \mathbf{R} .
- C:-The projection maps from a product space to the coordinate spaces are always closed.
- D:-The torus surface is a quotient space of the unit square.

Correct Answer:- Option-D

Question70:-Let X be an uncountable set and \mathfrak{T} be the co-finite topology on X . Then, choose the correct one from the following :

- A:- (X, \mathfrak{T}) is a connected, T_1 - space which is metrizable.
- B:- (X, \mathfrak{T}) is a second countable T_2 - space which is compact
- C:- (X, \mathfrak{T}) is a separable compact space which is not metrizable
- D:- (X, \mathfrak{T}) is a second countable T_1 - space which is metrizable

Correct Answer:- Option-C

Question71:-From the following given operations on the set of positive integers, choose the one which is a binary operation :

- A:- $a*b = \frac{(ab)}{2}$
- B:- $a*b = ab - a$
- C:- $a*b = ab + b$
- D:- $a*b = a - b$

Correct Answer:- Option-C

Question72:-Let $G = (V, E)$ be a simple graph. Choose the wrong statement from below :

- A:-G is bipartite implies G has a perfect matching
- B:-Any plane Graph has a dual graph
- C:-Two isomorphic graphs are having the same degree sequence
- D:-Any Hamiltonian graph is 2-connected

Correct Answer:- Option-A

Question73:-Let (X, d) be a metric space and $\{x_n\}$ be a sequence in X . Choose the correct statement from the following :

- A:-If $\{x_n\}$ is a Cauchy sequence, then it converges.
- B:-If $\{x_n\}$ converges in X , any subsequence converges to the same limit.
- C:-If $\{x_n\}$ is bounded, then it has a convergent subsequence.
- D:-If $\{x_n\}$ is unbounded, then it cannot have a convergent subsequence.

Correct Answer:- Option-B

Question74:-Let $X = \mathbb{R}^2$. From the following maps from X to X , choose the one which is a linear homeomorphism :

- A:- $F(x_1, x_2) = (x_1 - x_2, x_2 - x_1)$
- B:- $F(x_1, x_2) = (2x_1 - x_2, 0)$
- C:- $F(x_1, x_2) = (3x_1, 4x_1)$
- D:- $F(x_1, x_2) = (x_1 - x_2, x_1 + x_2)$

Correct Answer:- Option-D

Question75:-Let $E = \{x \in \mathbb{R} : x \text{ is rational}, 0 \leq x \leq 2\}$. The Lebesgue measure of E is :

- A:-2
- B:-1
- C:-not Lebesgue measurable
- D:-0

Correct Answer:- Option-D

Question76:-Among the following equations, choose the exact differential equation :

- A:- $12x^2ydx + 4x^3dy = 0$
- B:- $(x+y)dx + 3x^2ydy = 0$
- C:- $(dx)/x + (dy)/(xy^2) = 0$
- D:- $(4x^2 + 3y)dx + 6x^2y^2dy = 0$

Correct Answer:- Option-A

Question77:-Let $X = (C^2, \|\cdot\|_1)$. Let $A \in B L(X)$ be defined by $A(x_1, x_2) = (2x_2, x_1)$. Then $\|A\|$ is :

- A:-3
- B:- $3/2$
- C:-2
- D:-1

Correct Answer:- Option-C

Question78:-Let μ denote the Mobius function then $\mu(75)$ is :

- A:-1
- B:-0
- C:-15
- D:- -1

Correct Answer:- Option-B

Question79:-Consider the vector field defined by $\mathbf{X}(x_1, x_2) = (x_1, x_2, -x_2, x_1)$. Choose an integral curve of \mathbf{X} from the following :

- A:- $\alpha(t) = (e^t, e^{-t})$
- B:- $\alpha(t) = (\sin t, \cos t)$
- C:- $\alpha(t) = (\cos t, \sin t)$
- D:- $\alpha(t) = (t, t^2)$

Correct Answer:- Question Cancelled

Question80:-Let $X = \mathbb{R}^2$, $Y = \{(x, 0) : x \in \mathbb{R}\}$ where $\|\cdot\|_1$ is defined on X . Let $g : Y \rightarrow \mathbb{R}$ be defined by $g((x, 0)) = x$. From the following choose a Hahn-Banach extension of g :

- A:- $f(x_1, x_2) = x_1 + 2x_2$
- B:- $f(x_1, x_2) = (x_1 + x_2)/2$
- C:- $f(x_1, x_2) = x_1 - x_2$
- D:- $f(x_1, x_2) = 3x_1 + 4x_2$

Correct Answer:- Option-C

Question81:-Which of the following is not a solution of the two-dimensional Laplace equation :

- A:- $u = e^{x \sin y}$

- B:- $u = x^2 - y^2$
 C:- $u = x^2 + y^2$
 D:- $u = \log(x^2 + y^2)$
 Correct Answer:- Option-C

Question82:- A partial differential equation of the form $au_{xx} + 2bu_{xy} + cu_{yy} = F(x, y, u, u_x, u_y)$ is said to be elliptic if :

- A:- $ac - b^2 = 0$
 B:- $ac - b^2 > 0$
 C:- $ac - b^2 < 0$
 D:- $a + c = 2b$

Correct Answer:- Option-B

Question83:- General Integral of $yz_z + xz_z = xy$ is :

- A:- $F(x^2 - y^2, z^2 - y^2) = 0$

B:- $F\left(\frac{x}{y}, \frac{y}{z}\right) = 0$

- C:- $F(yz, xz) = 0$

D:- $F\left(\frac{1}{x} - \frac{1}{y}, \frac{xy}{z}\right) = 0$

Correct Answer:- Option-A

Question84:- Which of the following function is nowhere analytic :

- A:- $f(z) = 3x + y + i(3y - x)$
 B:- $f(z) = 2xy + i(x^2 - y^2)$
 C:- $f(z) = x^2 - y^2 + i2xy$
 D:- $f(z) = \cosh x + \cos y + i(\sinh x + \sin y)$

Correct Answer:- Option-B

Question85:- Let $u_{tt} = c^2 u_{xx}$ be the one-dimensional wave equation with boundary conditions $u(0, t) = 0, u(L, t) = 0$ for all t and initial conditions $u(x, 0) = f(x), u_t(x, 0) = g(x)$ for all x .

If $u(x, t) = \sum_{n=1}^{\infty} (a_n \cos \lambda_n t + b_n \sin \lambda_n t) \sin\left(\frac{n\pi x}{L}\right)$, then $a_n =$

A:- $\frac{2}{L} \int_0^L f(x) \cos \frac{n\pi x}{L} dx$

B:- $\frac{2}{L} \int_0^L g(x) \cos \frac{n\pi x}{L} dx$

C:- $\frac{2}{L} \int_0^L f(x) \sin \frac{n\pi x}{L} dx$

D:- $\frac{2}{L} \int_0^L g(x) \sin \frac{n\pi x}{L} dx$

Correct Answer:- Option-C

Question86:- Two-dimensional heat equation is :

A:- $u_t = c^2 (u_{xx} + u_{yy})$

B:- $u_{tt} = c^2 u_{xx}$

C:- $u_t = c^2 (u_x + u_y)$

D:- $u_t = c^2 (u_{xx} + u_x)$

Correct Answer:- Option-A

Question87:- Let $\phi(x) = x$ be an iteration function for solving the equation $f(x) = 0$ by fixed point iteration method. The iterations converges to a root, if :

- A:- $|\phi'(x_k)| > 1$, for $k = 0, 1, 2, \dots$

B: $|\phi(x_k)| < 1$, for $k=0, 1, 2, \dots$

C: $|\phi(x_{k+1})| \leq |\phi(x_k)|$, for $k=0, 1, 2, \dots$

D: $|\phi(x_k)| \leq 1/2 (|\phi(x_k)| + |\phi(x_k)|)$, for $k=0, 1, 2, \dots$

Correct Answer:- Option-B

Question88:-Let x_0 be an initial approximation to the root of an algebraic equation $f(x)=0$ and let x_k be the k^{th} iterate obtained in Newton-Rapson method. Then for $k=1, 2, 3, \dots$

A: $x_{k+1} = x_k + f(x_k)/(f'(x_k) - (x_k - x_0))$

B: $x_{k+1} = x_k + (f'(x_k))/(f(x_k) - (x_k - x_0))$

C: $x_{k+1} = x_k - (f'(x_k))/(f(x_k))$

D: $x_{k+1} = x_k - (f(x_k))/(f'(x_k))$

Correct Answer:- Option-D

Question89:-If Δ is the forward difference operator, then $\Delta^3 f(x_k) =$

A: $f(x_k) + 3f(x_{k-1}) + 3f(x_{k-2}) + f(x_{k-3})$

B: $f(x_k) - 3f(x_{k-1}) + 3f(x_{k-2}) - f(x_{k-3})$

C: $f(x_{k+3}) + 3f(x_{k+2}) + 3f(x_{k+1}) + f(x_k)$

D: $f(x_{k+3}) - 3f(x_{k+2}) + 3f(x_{k+1}) - f(x_k)$

Correct Answer:- Option-D

Question90:-Approximate value of $f(5)$ by Lagrange's interpolation polynomial using the following data :

x	3	6
$f(x)$	40	7

A:-18

B:-23.5

C:-4.5

D:-47

Correct Answer:- Option-A

Question91:-A Linear transformation T on $Z_N = \{z(1), z(2), \dots, z(N)/z(i) \in C, 1 \leq i \leq N\}$ is a Fourier multiplier operator iff the matrix of T in the Fourier basis is _____.

A:-Hermitian

B:-Skew Hermitian

C:-Orthogonal

D:-Diagonal

Correct Answer:- Option-D

Question92:-Which of the following is an elliptic function ?

A:-Weirstrass ρ function

B:-Weirstrass σ function

C:-Weirstrass Zeta function

D:- e^z

Correct Answer:- Option-A

Question93:-Domain of convergence of Riemann Zeta function is _____.

A:- $\text{Re } z > 0$

B:- $\text{Re } z > 1$

C:- $|z| > 1$

D:- $z > 1$

Correct Answer:- Option-B

Question94:-The relative cardinality of the Fuzzy set $A = \{(a, 0.1), (b, 0.5), (c, 0.9)\}$ is _____.

A:-1.5

B:-0.5

C:-1

D:-0

Correct Answer:- Option-B

Question95:-Tychonoff's theorem states that :

A:-Arbitrary product of compact spaces is compact in the product topology

B:-Arbitrary product of hausdorff spaces is hausdorff in the product topology

C:-Arbitrary product of regular spaces is regular in the product topology

D:-Arbitrary product of normal spaces need not be normal in the product topology

Correct Answer:- Option-A

Question96:-The language generated by the Grammar $G = (\{S\}, \Sigma = \{a, b\}, S, \{S \rightarrow aSb \mid \lambda\})$ is _____.

A: $\{a^n b^n, n \geq 1\}$

B: $\{b^n a^n, n \geq 1\}$

C: $\{a^n b^n, n \geq 0\}$

D: $\{b^n a^n, n \geq 0\}$

Correct Answer: Option-C

Question97: Which of the following is true for the following differential equation ?

$$(1 - x^2) y'' - 2xy' + 2y = 0$$

A: $x = \infty$ is an ordinary point

B: $x = \infty$ is a regular singular point

C: $x = \infty$ is an irregular singular point

D: none of these

Correct Answer: Option-B

Question98: The integral curve through (1, -1) of the gradient field of $f(x, y) = (x^2 + y^2)/2$ is _____.

A: (e^t, e^t)

B: $(-e^t, e^t)$

C: $(-e^t, -e^t)$

D: $(e^t, -e^t)$

Correct Answer: Option-D

Question99: The integral equation corresponding to the initial value problem $y'' + xy' + (1 - x^2)y = f(x)$, $y(0) = 0$, $y'(0) = 0$ is a _____.

A: Volterra equation of first kind

B: Fredholm equation of first kind

C: Volterra equation of second kind

D: Fredholm equation of second kind

Correct Answer: Option-C

Question100: If a source of strength m is at the origin, the corresponding stream function is $\psi =$

A: $m\theta$

B: $-m\theta$

C: $-\theta/m$

D: $-\theta/m$

Correct Answer: Option-A