ಈ ಪ್ರಶ್ನೆಪುಸ್ತಿಕೆಯನ್ನು ತೆರೆಯುವಂತೆ ನಿಮಗೆ ತಿಳಿಸುವವರೆಗೂ ಇದನ್ನು ತೆರೆಯಕೂಡದು.

2018

ಪ್ರಶ್ನೆಪತ್ರಿಕೆ
ನಿರ್ದಿಷ್ಟ ಪತ್ರಿಕೆ
ಪತ್ರಿಕೆ - II

ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ವರ್ಷನ್ ಕೋಡ್

A

ಗರಿಷ್ಠ ಸಮಯ : **2** ಗಂಟೆಗಳು

ವಿಷಯ ಸಂಕೇತ : 345

ಗರಿಷ್ಠ ಅಂಕಗಳು : **200**

ಸೂಚನೆಗಳು

1. ಪರೀಕ್ಷೆ ಪ್ರಾರಂಭವಾದ ಕೂಡಲೇ ನಿಮ್ಮ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯಲ್ಲಿ ಅಮುದ್ರಿತ ಅಥವಾ ಹರಿದಿರುವ ಅಥವಾ ಬಿಟ್ಟು ಹೋಗಿರುವ ಪುಟಗಳು ಅಥವಾ ಪ್ರಶ್ನೆಗಳು ಇತ್ಯಾದಿಗಳು ಕಂಡುಬಂದಲ್ಲಿ ನಿಮ್ಮ ಒ.ಎಂ.ಆರ್. ಉತ್ತರಪತ್ರಿಕೆಯಲ್ಲಿ ಮುದ್ರಿತವಾಗಿರುವ ಅದೇ ಶ್ರೇಣಿಯ ಪೂರ್ಣ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯೊಂದಿಗೆ ಬದಲಾಯಿಸಿಕೊಳ್ಳತಕ್ಕದ್ದು.
2. **ಅಭ್ಯರ್ಥಿಯು ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯ ಶ್ರೇಣಿಯು, ತಮ್ಮ ಒ.ಎಂ.ಆರ್. ಉತ್ತರಪತ್ರಿಕೆಯಲ್ಲಿ ಮುದ್ರಿತವಾಗಿರುವ ಅದೇ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯ ಶ್ರೇಣಿಯಾಗಿರುವುದೇ ಎಂಬುದನ್ನು ಖಚಿತಪಡಿಸಿಕೊಳ್ಳಬೇಕು. ವ್ಯತ್ಯಾಸಗಳು ಕಂಡುಬಂದಲ್ಲಿ, ಸಂವೀಕ್ಷಕರ ಗಮನಕ್ಕೆ ತರುವುದು ಮತ್ತು ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯ ಶ್ರೇಣಿಯು ತಮಗೆ ಹೊಂದುವ (ಅದೇ) ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯಾದ ಮತ್ತು ಒ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಮುದ್ರಿತವಾಗಿರುವ ಶ್ರೇಣಿಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯನ್ನೇ ಪಡೆಯತಕ್ಕದ್ದು.**
3. ಪಕ್ಕದಲ್ಲಿ ಒದಗಿಸಿರುವ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯ ಚೌಕದಲ್ಲೇ ನಿಮ್ಮ ನೋಂದಣಿ ಸಂಖ್ಯೆಯನ್ನು ನಮೂದಿಸಬೇಕು. ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯಲ್ಲಿ ಬೇರೆ ಏನನ್ನೂ ಬರೆಯಬಾರದು.

ನೋಂದಣಿ ಸಂಖ್ಯೆ						

4. **ಈ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ 100 ಪ್ರಶ್ನೆಗಳನ್ನು ಒಳಗೊಂಡಿರುತ್ತದೆ.** ಪ್ರತಿಯೊಂದು ಪ್ರಶ್ನೆಯು **4** ಪ್ರತಿಕ್ರಿಯೆಗಳನ್ನು (ಉತ್ತರಗಳನ್ನು) ಒಳಗೊಂಡಿರುತ್ತದೆ. ನೀವು ಉತ್ತರ ಹಾಳೆಯಲ್ಲಿ ಗುರುತು ಮಾಡಬೇಕೆನಿಸುವ ಉತ್ತರವನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಿ. ಒಂದು ವೇಳೆ ಅಲ್ಲಿ ಒಂದಕ್ಕಿಂತ ಹೆಚ್ಚು ಸರಿಯಾದ ಉತ್ತರಗಳಿವೆಯೆಂದು ನೀವು ಭಾವಿಸಿದರೆ ನಿಮಗೆ ಅತ್ಯುತ್ತಮವೆನಿಸುವ ಉತ್ತರಕ್ಕೆ ಗುರುತು ಮಾಡಿ. ಏನೇ ಆದರೂ ಪ್ರತಿ ಪ್ರಶ್ನೆಗೆ ನೀವು ಕೇವಲ ಒಂದು ಉತ್ತರವನ್ನು ಮಾತ್ರ ಆಯ್ಕೆ ಮಾಡಬೇಕು.
5. ಎಲ್ಲಾ ಉತ್ತರಗಳನ್ನು ನಿಮಗೆ ಒದಗಿಸಲಾಗಿರುವ ಪ್ರತ್ಯೇಕ ಒ.ಎಂ.ಆರ್. ಉತ್ತರಪತ್ರಿಕೆಯ ಮೇಲೆ ಕೇವಲ **ಕಪ್ಪು ಅಥವಾ ನೀಲಿ ಶಾಯಿಯ ಬಾಲ್ ಪಾಯಿಂಟ್ ಪೆನ್ನಿನಲ್ಲಿ** ಮಾತ್ರ ಗುರುತು ಮಾಡಬೇಕು. ಒ.ಎಂ.ಆರ್. ಉತ್ತರಪತ್ರಿಕೆ ಹಾಳೆಯಲ್ಲಿನ ವಿವರವಾದ ಸೂಚನೆಗಳನ್ನು ಗಮನಿಸುವುದು.
6. **ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳಿಗೆ ಸಮಾನ ಅಂಕಗಳು. ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿರಿ. ಪ್ರತಿ ತಪ್ಪು ಉತ್ತರಕ್ಕೆ ಪ್ರಶ್ನೆಗೆ ನಿಗದಿಪಡಿಸಿದ ಅಂಕಗಳ $1/4^{th}$ (0.25) ರಷ್ಟು ಅಂಕಗಳನ್ನು ಕಳೆಯಲಾಗುವುದು.**
7. ಚಿತ್ತು ಕೆಲಸಕ್ಕಾಗಿ ಹಾಳೆಗಳನ್ನು ಪ್ರಶ್ನೆಪುಸ್ತಿಕೆಯ ಕೊನೆಯಲ್ಲಿ ಸೇರಿಸಲಾಗಿದೆ. ಪ್ರಶ್ನೆಪುಸ್ತಿಕೆಯ ಇನ್ನುಳಿದ ಯಾವ ಭಾಗದಲ್ಲಿಯೂ ನೀವು ಯಾವ ರೀತಿಯ ಗುರುತನ್ನು ಮಾಡತಕ್ಕದ್ದಲ್ಲ.
8. ಪರೀಕ್ಷೆಯ ಮುಕ್ತಾಯವನ್ನು ಸೂಚಿಸುವ ಅಂತಿಮ ಗಂಟೆ ಬಾರಿಸಿದ ತಕ್ಷಣವೇ ಒ.ಎಂ.ಆರ್. ಉತ್ತರಪತ್ರಿಕೆ ಹಾಳೆಯಲ್ಲಿ ಇನ್ನಾವುದೇ ಗುರುತು ಮಾಡುವುದನ್ನು ನಿಲ್ಲಿಸಬೇಕು. ಸಂವೀಕ್ಷಕರು ಬಂದು ನಿಮ್ಮಲ್ಲಿರುವ ಒ.ಎಂ.ಆರ್. ಉತ್ತರಹಾಳೆಯನ್ನು ತಮ್ಮ ವಶಕ್ಕೆ ಪಡೆದುಕೊಂಡು ಲೆಕ್ಕಕ್ಕೆ ತೆಗೆದುಕೊಳ್ಳುವವರೆಗೂ ನಿಮ್ಮ ನಿಮ್ಮ ಆಸನದಲ್ಲಿಯೇ ಕುಳಿತಿರತಕ್ಕದ್ದು.
9. ಪ್ರಶ್ನೆಗಳು ಕನ್ನಡ ಮತ್ತು ಆಂಗ್ಲ ಭಾಷೆಯಲ್ಲಿರುತ್ತವೆ. ಕನ್ನಡ ಪ್ರಶ್ನೆಗಳಲ್ಲಿ ಸಂದೇಹ ಉಂಟಾದರೆ, ದಯವಿಟ್ಟು ಆಂಗ್ಲ ಭಾಷೆಯ ಪ್ರಶ್ನೆಗಳನ್ನು ಗಮನಿಸುವುದು. ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯ ಪ್ರಶ್ನೆಗಳಲ್ಲಿ ಯಾವುದೇ ಗೊಂದಲಗಳಿದ್ದರೂ ಆಂಗ್ಲಭಾಷೆಯ ಪ್ರಶ್ನೆಗಳೇ ಅಂತಿಮವಾಗಿರುತ್ತದೆ.

ಯಾವುದೇ ರೀತಿಯ ಮೊಬೈಲ್ ಫೋನ್, ಕ್ಯಾಲ್ಕ್ಯುಲೇಟರ್ ಮತ್ತು ಇತರೆ ರೀತಿಯ ಎಲೆಕ್ಟ್ರಾನಿಕ್ / ಕಮ್ಯೂನಿಕೇಷನ್ ಸಾಧನಗಳು ಇತ್ಯಾದಿಗಳನ್ನು ಪರೀಕ್ಷಾ ಕೇಂದ್ರದ ಆವರಣದೊಳಗೆ ತರುವುದನ್ನು ನಿಷೇಧಿಸಿದೆ.

Note : English version of the instructions is printed on the back cover of this booklet.

1. If $a > k$, then
$\lim_{n\to\infty}((a-1)^n + (a-2)^n + \cdots + (a-k)^n)^{\frac{1}{n}} =$

(1) 0
(2) a-1
(3) a-k
(4) ∞

2. The value of the integral $\int_1^{\pi}[x]dx$ is

(1) $\pi - 1$
(2) $2\pi - 3$
(3) $3\pi - 6$
(4) $4\pi - 9$

3. The series $\sum_{n=1}^{\infty} \frac{\sqrt{n+1}-\sqrt{n}}{n^x}$

(1) diverges for $x > 1$
(2) converges only for $x > 1$
(3) diverges for $x \in \left(\frac{1}{2}, 1\right)$
(4) converges for $x > \frac{1}{2}$

4. The number of elements of order 35 in Z_{70} is
(1) 2
(2) 12
(3) 24
(4) 35

5. The number of different subgroups of S_4 isomorphic to S_3 is
(1) 3
(2) 4
(3) 7
(4) 12

6. The number of elements in the center of the dihedral group D_{20} is
(1) 10
(2) 20
(3) 2
(4) 1

7. The number of positive eigen values of the matrix
$A = \begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$ is

(1) 1
(2) 2
(3) 3
(4) 5

8. The rank of the matrix $A = \begin{bmatrix} 1 & e & e^2 & \cdots & e^n \\ 1 & e & e^2 & \cdots & e^n \\ \vdots & \vdots & \vdots & & \vdots \\ 1 & e & e^2 & \cdots & e^n \end{bmatrix}$ is
(1) $n+1$
(2) n
(3) 2
(4) 1

9. Suppose that P and Q are $n \times n$ matrices such that $P^2=P$, $Q^2=Q$ and $1 - (P + Q)$ is invertible. Then
(1) Rank of P < Rank of Q
(2) Rank of Q < Rank of P
(3) (Rank of P) · (Rank of Q) is a perfect square
(4) (Rank of P) · (Rank of Q) is not a perfect square

10. If $A = \begin{pmatrix} 1 & 2 \\ 1 & -1 \end{pmatrix}$ and $A^{-1} = \lambda A$, *then* λ=

(1) $\frac{1}{2}$

(2) $\frac{1}{3}$

(3) $\frac{1}{4}$

(4) $\frac{1}{5}$

11. The values of i^i are

(1) $\left\{e^{-\left(\frac{\pi}{2}+2k\pi\right)} | k \in \mathbb{Z}\right\}$

(2) $\left\{e^{-\left(\frac{\pi}{2}+k\pi\right)} | k \in \mathbb{Z}\right\}$

(3) $\left\{e^{\left(\frac{\pi}{2}+k\pi\right)} | k \in \mathbb{Z}^+\right\}$

(4) $\left\{e^{\left(\frac{\pi}{2}+2k\pi\right)} | k \in \mathbb{Z}\right\}$

12. Let the sequence $\{a_n\}_{n=0}^{\infty}$ be defined by the equation

$$\sum_{k=0}^{\infty} (-1)^k x^{2k} = \sum_{n=0}^{\infty} a_n (x-3)^n,$$

$o < x < 1$.

Then $\lim_{n\to\infty} sup\left(|a_n|^{1/n}\right) =$

(1) $\frac{1}{\sqrt{3}}$

(2) $\frac{1}{3}$

(3) $\frac{1}{\sqrt{10}}$

(4) ∞

13. In discrete topology, the number of subsets of $X = \{1, 2, 3, 4\}$ which are both compact and connected is

(1) 0

(2) 4

(3) 2^4

(4) 5

14. If a set B is formed by adjoining to the connected set A of topological space X, some of its limit points (not all), then B is

(1) connected

(2) disconnected

(3) compact

(4) closed

15. The Lebesgue measure of the set

$E = \bigcap_{n=1}^{\infty} \left(-\frac{1}{n}, 1+\frac{1}{n}\right)$ is

(1) $\frac{1}{n}$

(2) $1 + \frac{1}{2n}$

(3) 1

(4) 0

16. Newton-Raphson iteration formula for finding $\sqrt[3]{c}$, where c > 0

(1) $x_{n+1} = \frac{2x_n^3 + \sqrt[3]{c}}{2x_n^2}$

(2) $x_{n+1} = \frac{3x_n^3 - \sqrt[3]{c}}{3x_n^2}$

(3) $x_{n+1} = \frac{2x_n^3 + c}{3x_n^2}$

(4) $x_{n+1} = \frac{3x_n^3 + c^3}{2x_n^2}$

17. $\lim_{n\to\infty} \frac{1}{n}\left(\frac{1}{2} + \sqrt{\frac{1}{2}} + \sqrt[3]{\frac{1}{2}} + \cdots + \sqrt[n]{\frac{1}{2}}\right) =$

(1) 0

(2) 1

(3) 1/2

(4) ∞

18. Which one of the following series is divergent?

(1) $\sum_{n=1}^{\infty} \frac{(n+1)(n+2)\ldots\ldots\ldots(n+n)}{n^n}$

(2) $\sum_{n=1}^{\infty} \left(\frac{n^5+1}{3^n+2}\right)$

(3) $\sum_{n=1}^{\infty} (-1)^n n^{\left(\frac{1-n}{n}\right)}$

(4) $1+\frac{1}{\sqrt{2}}-\frac{2}{\sqrt{3}}+\frac{1}{\sqrt{4}}+\frac{1}{\sqrt{5}}-\frac{2}{\sqrt{6}}+\cdots$

19. $\lim_{x\to 0}\left(\frac{1+cos}{2}\right)^{1/x^2} =$

(1) i (2) e

(3) e^{-1} (4) ∞

20. Which one of the following sequences of functions is uniformly convergent?

(1) $f_n(x) = \frac{1}{1+nx}$, $x \in (0,1), n = 1,2,....$

(2) $f_n(x) = \frac{nx}{1+n^2x^2}$, $x \in \mathbb{R}^+$, $n = 1, 2, \ldots$ $f_n(x) = \frac{nx}{1+n^2x^2}$, $x \in \mathbb{R}^+, n = 1,2,....$

(3) $f_n(x) = nx(1-x)^n$, $x \in (0,1), n = 1,2,....$

(4) $f_n(x) = \frac{x}{1+nx}$, $x \in (0,1), n = 1,2,....$

21. Which one of the following statements is not true?

(1) Every group of order 4 is abelian

(2) Every group of order 6 is abelian

(3) If every element in a group G is its own inverse, then G is abelian

(4) If in a group G, $(ab)^2 = a^2b^2$, for all a, b$\in$G, then G is abelian

22. Let Q be a homomorphism of a group G into a group $\bar{G}$ with Kernel K. Then which one of the following statements is not true?

(1) K is normal subgroup of G.

(2) $\frac{G}{K}$ is isomorphic to $\bar{G}$

(3) $|G| = |K| + |im\ Q|$, whenever G and $\bar{G}$ are finite groups.

(4) Q is injective if and only if K=$\{e\}$, e is the identity element.

23. Let G be a group of order 20449, then the number of 11-Sylow subgroups of G is

(1) 1

(2) 2

(3) 11

(4) 13

24. The polynomial x^3+x^2+x+1 is divisible by x^2+3x+2 over the domain

(1) $\mathbb{Z}_{11}$

(2) $\mathbb{Z}_7$

(3) $\mathbb{Z}_5$

(4) $\mathbb{Z}_3$

25. Which one of the following statements is not true?

(1) A finite integral domain is a field

(2) if $\mho$ is an ideal of a ring R and $1 \in \mho$, then $\mho =$

(3) Let R be a commutative ring with unit element and M be an ideal of R. Then M is a maximal ideal of R if and only if R/M is an integral domain

(4) Let K, L and F be fields. If L is a finite extension of K and K is a finite extension of F, then [L:F]=[L:K][K:F]

26. Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation defined by T(3,1)=(2, –4) and T(1,1) = (0,2). Then T(–2,4)=

(1) $(-6, 26)$

(2) $(1, 2)$

(3) $(6, 26)$

(4) $(-6, -26)$

27. Let X and Y be topological spaces and $f: x \to y$ be a map. Which one of the following statements is not true?

(1) f is continuous if and only if for every subset A of X, $f(\bar{A}) \subset \overline{f(A)}$

(2) If X is compact, Y is Hausdorff and f is a bijective continuous, function, then f is a homeomorphism

(3) If f is surjective and continuous, X is connected, then Y is connected.

(4) If X is a subspace of Y, then f is not continuous.

28. Let $f, g: X \to Y$ be continuous and let Y be Hausdorff. Then the set $A = \{x | f(x) = g(x)\}$ is

(1) Closed in Y

(2) Closed in X

(3) Open in X

(4) Open in Y

29. Which one of the following statements is not true?

(1) Every metrizable space is normal

(2) Every compact Hausdorff space is normal

(3) Every regular space with a countable basis is normal

(4) Every normal space is metrizable

30. The general solution of the differential equation.

$$\frac{dy}{dx} = x^{2x^2}\sin\left(e^{x^2}\right) is$$

(1) $y = -\frac{1}{2}e^{x^2}\cos\left(e^{x^2}\right) - \frac{1}{2}\sin\left(e^{x^2}\right) + c$

(2) $y = -e^{x^2}\cos\left(e^{x^2}\right) + \sin\left(e^{x^2}\right) + c$

(3) $y = -\frac{1}{2}e^{x^2}\cos\left(e^{x^2}\right) + \frac{1}{2}\sin\left(e^{x^2}\right) + c$

(4) $y = \frac{1}{2}e^{x^2}\cos\left(e^{x^2}\right) + \frac{1}{2}\sin\left(e^{x^2}\right) + c$

31. The general solution of the differential equation $y'' - 2y' + y = e^x + x$ is

(1) $y = (c_1 + c_2x)e^x + 2 + x + \frac{1}{3}x^2e^x$

(2) $y = (c_1 + c_2x)e^x + 2 + x + x^2e^x$

(3) $y = (c_1 + c_2x)e^x + x + x^2e^x$

(4) $y = (c_1 + c_2x)e^x + 2 + x + \frac{1}{2}x^2e^x$

32. Res $\left((z^2 + 2z)cosec^2z, 0\right)$=

(1) $\frac{\pi}{2}$

(2) 1

(3) 0

(4) 2

33. An analytic function $f(z)$ whose real part $u(x, y) = y^3 - 3x^2y$ is

(1) $f(z) = i(z^3 + c)$

(2) $f(z) = z^3 + ic$

(3) $f(z) = z^3 + iz + c$

(4) $f(z) = z^3 + i(z + c)$

34. The image of $y = x + 1$ under the mapping $\omega = u + iv = z^2$ is

(1) $u = (v^2 - 1)$

(2) $v = (u^2 - 1)$

(3) $v = \frac{1}{2}(u^2 - 1)$

(4) $u = \frac{1}{2}(v^2 - 1)$

35. $\int_0^\infty x(x^2 + 1)^{-2}\sin x\, dx =$

(1) $\frac{\pi i}{2e}$ (2) $\frac{\pi}{2e}$

(3) $\frac{\pi i}{4e}$ (4) $\frac{\pi}{4e}$

36. The Lagrange interpolation polynomial of least degree satisfying $f(2) = 2, f(0) = 0$, $f(1) = 3$ and $f(3) = 8$ is

(1) $f(x) = \frac{1}{3}(2x^3 - 2x^2 - x)$

(2) $f(x) = \frac{1}{6}(11x^3 - 45x^2 + 52x)$

(3) $f(x) = \frac{1}{3}(x^3 - 4x^2 + 12x)$

(4) $f(x) = \frac{1}{6}(10x^3 - 20x^2 + x)$

37. Which one of the following statements is not true?

(1) A set E is said to be measurable provided for any set $A, \mu^*(A) = \mu^*(A \cap E) + \mu^*(A \cap E^c)$, where μ^* is the outer measure.

(2) If A is the set of all irrational numbers in the interval [0,1], then $\mu^*(A) = 0$

(3) The union of a countable collection of measurable sets is measurable.

(4) The cantor set is of measure zero

38. The solution of the differential equation $g^1(x) = 2g(x)$, $g(0)=a$, where 'a' is a real constant is

(1) ae^x

(2) ae^{2x}

(3) ae^{-x}

(4) ae^{-2x}

39. If $f: x \to y$ is a continuous function from compact metric space X onto a metric space Y then which of the following is true ?

A. f^{-1} is continuous on Y

B. f is a homeomorphism

Select the code for the correct answer:

(1) A only

(2) B only

(3) Both A and B

(4) Neither A nor B

40. If $\{x_n\}$ is a sequence defined by $x_n = \left(\frac{e}{\pi}\right)^n \cos(4n^3 + 7)$ then $\lim_{n\to\infty} x_n$ is equal to

(1) 0

(2) 1

(3) e

(4) π

41. The limit superior and limit inferior of $\{(-1)^n\}_{n=1}^{\infty}$ are respectively

(1) 1 and -1

(2) 1 and $-\infty$

(3) ∞ and -1

(4) ∞ and $-\infty$

42. The solution of the following system of equations is

$$8x_2 + 2x_3 = -7$$
$$3x_1 + 5x_2 + 2x_3 = 8$$
$$6x_1 + 2x_2 + 8x_3 = 26$$

(1) $x_1 = 4, x_2 = -1, x_3 = \frac{1}{2}$

(2) $x_1 = -1, x_2 = 4, x_3 = \frac{1}{2}$

(3) $x_1 = \frac{1}{2}, x_2 = -1, x_3 = 4$

(4) None of the above

43. Let $f = u + i$ be analytic in a connected open set D, where u and v are real valued. Suppose there exist real constants a,b and c such that $a^2+b^2\neq 0$ and $au+bv=c$ in D. Then which of the following statements holds for f?

(1) f must be constant in D

(2) f is not necessarily constant in D

(3) f is not constant in D

(4) None of the above

44. The value of the integral $\oint_C \frac{4-3z}{z^2-2}\,dz$ anticlockwise around any simple closed path such that 0 and 1 are inside C, is

(1) $-6\pi i$

(2) $-8\pi i$

(3) $2\pi i$

(4) 0

45. The bilinear transformation which maps the points $z = \infty, i, 0$ of z-plane into $\omega = 0,1, \infty$ of ω-plane respectively is

(1) $\omega = z$

(2) $\omega = -z$

(3) $\omega = \frac{1}{2}$

(4) $\omega = -\frac{1}{2}$

46. A function of x, y possessing continuous partial derivatives of first and second order is called harmonic function if it satisfies

(1) Euler's equation

(2) Lagrange's equation

(3) Laplace equation

(4) None of the above

47. If C is a circle $|z - a| = r$ then

$\int_C \frac{dz}{z - a}$ is

(1) $2\pi i$

(2) 0

(3) $-2\pi i$

(4) πi

48. Degree of $\theta\left(\sqrt{2}, \sqrt{3}\right)$ over θ, where θ is the field of rational numbers is

(1) 3

(2) 4

(3) 1

(4) 2

49. A product of regular space is

(1) Hausdroff

(2) disjoint

(3) regular

(4) None of the above

50. General solution of differential equation

$\frac{dy}{dx} + tan\, x \tan y = \cos x \sec y$

(1) $\sin y = (x + c)\cos x$

(2) $\sin y = (x + c)\sin y$

(3) $\sin x = (x + c)\sin y$

(4) $\cos y = (x + c)\sin x$

51. The equation $\frac{\delta z}{\delta x}e^y = \frac{\delta z}{\delta y}e^x$ gives the general solution

(1) $z = ae^x - be^x$

(2) $z = e^x + e^y$

(3) $z = \phi(e^x + e^y)$

(4) None of the above

52. The value of m so that $2x - x^2 + my^2$ may be harmonic is

(1) 0

(2) 2

(3) 1

(4) 3

53. A set is compact then it has

(1) Hein-Borel Property

(2) Unbounded Property

(3) Open set Property

(4) None of these

54. $\dim(V) = m$, $\dim(U) = n$ then $\dim(\mathrm{Hom}(V, U))$ is equal to

(1) m^n

(2) n^m

(3) mn

(4) m

55. Let B and B' be two Banach spaces if T is a continuous linear Transformation of B and B' then

(1) T is open mapping

(2) T is closed mapping

(3) T is both open and closed mapping

(4) T is neither open nor closed mapping

56. If M is a closed linear subspace of a Hilbert space H then

(1) $H = M$

(2) $H = M^{\perp}$

(3) $H = M \oplus M^{\perp}$

(4) $H \neq M \oplus M^{\perp}$

57. Laplace equation in polar co-ordinate form is

(1) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$

(2) $r^2 \frac{\partial^2 u}{\partial r^2} + r \frac{\partial u}{\partial r} + \frac{\partial^2 u}{\partial \theta^2} = 0$

(3) $r \frac{\partial^2 u}{\partial x^2} + r^2 \frac{\partial u}{\partial r} + \frac{\partial^2 u}{\partial \theta^2} = 0$

(4) $\frac{\partial^2 u}{\partial r^2} + \theta \frac{\partial u}{\partial r} + \theta^2 \frac{\partial^2 u}{\partial \theta^2} = 0$

58. The solution of the system of equations

$2x + y + 4z = 16, 3x + 2y + z = 10, x + 3y + 3z = 16$

by Gauss elimination method is

(1) 1,1,1

(2) 3,2,1

(3) 1,2,3

(4) 0,1,2

59. The root of the equation $x^3 + x + 1 = 0$ correct to the three decimal places by iteration method

(1) –0.826

(2) 0.826

(3) 0.682

(4) –0.682

60. The value of $(\nabla + \Delta)^2(x^2 + x + 1)$ with interval difference 1 is

(1) 6

(2) 8

(3) 10

(4) 12

61. A real valued function Q is simple if it is

(1) Measurable & assume only finite number of values

(2) Not measurable & assume only finite number of values

(3) Measurable

(4) Assume only finite values

62. Let f and g be two non-negative measurable functions. If f is integrable over E and $f(x) < g(x)$ on E, then

(1) g is integrable &
$$\int_E f - g = \int_E f - \int_E g$$

(2) g is integrable &
$$\int_E f - g < \int_E f - \int_E g$$

(3) g is integrable &
$$\int_E f - g > \int_E f - \int_E g$$

(4) None of these

63. A real valued function ϕ is _____ function if it is Lebesgue measurable and assume only a finite number of values.

(1) simple

(2) complex

(3) descrete

(4) None of these

64. Which of the following is false?

(1) $Re(Z_1 + Z_2) = Re(Z_1) + Re(Z_2)$

(2) $|Z_1 + Z_2| \geq |Z_1| + |Z_2|$

(3) $|Z_1 Z_2| = |Z_1||Z_2|$

(4) $\overline{Z_1 + Z_2} = \overline{Z_1} + \overline{Z_2}$

65. If α, β are roots of the equation $x^2 - 2xy + 4 = 0$ then $\alpha^n + \beta^n$ is equal to

(1) $2^{n+1} \cos n\frac{\pi}{3}$

(2) $2^n \cos n\frac{\pi}{3}$

(3) $2^{n+1} \sin n\frac{\pi}{3}$

(4) $2^n \sin n\frac{\pi}{3}$

66. Let H be finite difference then shift operator is defined as

(1) $Ef(x) = f(x)$

(2) $Ef(x) = f(x - h)$

(3) $Ef(x) = f(x + \ )$

(4) None of these

67. Following is the Littlewoods's three Principles,

A. Every measurable set is nearly a finite union of intervals.

B. Every measurable set is nearly continuous

C. Every convergent sequence of measurable functions is nearly uniformly convergent

Which of the above is/are correct ? Select the code for the correct answer from the option given below.

(1) A only

(2) B only

(3) A and C only

(4) None of the above

68. Let $\Omega = \{a, b, c, d\}$. Consider the classes $F_1 = \{\Omega, \phi, \{a\}\}$ and $F_2 = \{\Omega, \phi, \{a\}, \{b, c, d\}\}$. Which one of the following statement is true?

(1) Both F_1 and F_2 are not σ-algebra.

(2) F_1 is σ -algebra, but F_2 is not σ -algebra.

(3) Both F_1 and F_2 are σ -algebra.

(4) None of these

69. The _____ of a random variable X is defined as

$F_x(X) = P_X((-\infty, X]), X \in \mathbb{R}$.

(1) Probability distribution function

(2) Probability density function

(3) Cumulative distribution function

(4) None of these

70. The sequence $\{S_n\}$ defined by the recursion relation.

$S_{n+1} = \sqrt{3S_n}$, $S_1 = 1$. Then the sequence

(1) Divergent sequence

(2) Converges to 0

(3) Converges to 1

(4) Converges to 3

71. Which of the following is irreducible over $\mathbb{Z}$?

(1) $x^2 - 5x + 6$

(2) $x^2 - 7x + 12$

(3) $x^2 - 9x + 20$

(4) None of these

72. If r is the positive characteristic root and s is the negative characteristic root, then rank (Q)= r + s is called the

(1) Rank of real quadratic form of Q

(2) Signature of real quadratic form of Q

(3) Nullity of real quadratic form of Q

(4) Range of real quadratic form of Q

73. Let (X, τ) be a topological space, where $x = \{1,2,3,4,5\}$ and $\tau = \{x, \phi, \{1\}, \{2\}, \{1, 2\}, \{4, 5\}, \{1, 2, 4, 5\}, \{1, 4, 5\}, \{2, 4, 5\}\}$

Then, which of the following is neighbourhood of 2?

(1) $\{1,3\}$

(2) $\{3,4,5\}$

(3) $\{1,2,4,5\}$

(4) None of these

74. The real linear space $C^1[0,1]$ of all continuously differentiable functions defined on [0,1] equipped with norm given by

$||x||_\infty = \sup_{\hbar \in [0, 1]} |x(\hbar)|$ is a/an :

(1) Complete normed space

(2) Banach space

(3) Incomplete normed space

(4) Hilbert space

75. Let $\{e_i\}$is an orthonormal set in a Hilbert space H, and if x is any vector in H, then the set $S = \{e_i : (x, e_i) \neq 0\}$ is

(1) Empty Set

(2) Countable

(3) Either empty or countable

(4) Neither empty nor countable

76. Solution of the equation $p^2 + q^2 = x + y$ is

(1) $z = \frac{2}{3}(a - x)^{3/2} + \frac{2}{3}(y - a)^{3/2} + b$

(2) $z = \frac{2}{3}(a + x)^{3/2} + \frac{2}{3}(y - a)^{3/2} + b$

(3) $z = (a + x)^{3/2} + (y - a)^{3/2}$

(4) None of these

77. The value of the integral

$$\int_{|z|=3} \frac{1}{z(z-1)}\,dz \text{ is}$$

(1) 0 (2) 1

(3) 2 (4) 3

78. A subset y of topological space x is dense in x, if

(1) $\bar{y} = x$

(2) $\bar{y} \not\subset x$

(3) $y = x$

(4) None of these

79. Let X be a topological space. The space X is called connected

(1) if there exists a separation of X

(2) if there does not exists a separation of X

(3) if there exists some separation of X

(4) None of the above

80. A topological space x that has a countable basis at each of its points is said to satisfy

(1) the First countability axiom

(2) the Second countability axiom

(3) the Third countability axiom

(4) the Fourth countability axiom

81. The error in Schmidt's explicit formula is least if $\lambda =$

(1) $\frac{1}{3}$

(2) $\frac{1}{2}$

(3) $\frac{1}{12}$

(4) $\frac{1}{6}$

82. The solution of $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$, $0 < x \quad 1, t > 0$, with initial conditions u(x,0)=100(x–x^2), $\frac{\partial u}{\partial t}(x, 0) = 0$, and boundary conditions u(0,t)=0, u(1,t)=0, for h=1/4 at first level

(1) $u\left(\frac{1}{4}, 1\right) = 12.5,\ u\left(\frac{1}{2}, 1\right) = 18.75,$ $u\left(\frac{3}{4}, 1\right) = 12.5$

(2) $u\left(\frac{1}{4}, 1\right) = u\left(\frac{1}{2}, 1\right) = u\left(\frac{3}{4}, 1\right) =$ 12.5

(3) $u\left(\frac{1}{4}, 1\right) = u\left(\frac{1}{2}, 1\right) = u\left(\frac{3}{4}, 1\right) =$ 18.5

(4) None of these

83. The partial differential equation of all planes which are at a distance 'a' from the origin is

(1) $z = px + qy + a\sqrt{p^2 + q^2}$ where $p = \frac{\partial z}{\partial x}, and\ q = \frac{\partial z}{\partial y}$

(2) $z = px + qy + a\sqrt{1 + p^2 + q^2}$ where $p = \frac{\partial z}{\partial x}, and\ q = \frac{\partial z}{\partial y}$

(3) $z = px^2 + qy^2 + a\sqrt{1 + p^2 + q^2}$ where $p = \frac{\partial z}{\partial x}, and\ q = \frac{\partial z}{\partial y}$

(4) None of these

84. The solution of $\frac{\partial^3 z}{\partial x^3} + 4\frac{\partial z}{\partial x} = 0$, given that $z = 0, \frac{\partial z}{\partial x} = 0$ and $\frac{\partial^2 z}{\partial x^2} = 4$ when x=0 is

(1) $z(x, y) = 2\cos^2 x$

(2) $z(x, y) = 2\sin^2 2x$

(3) $z(x, y) = 2\cos^2 2x$

(4) None of these

85. The differential equation $\left(\frac{dy}{dx}\right)^2 + 5(y)^{1/3} = x$ is

(1) Linear of degree 3

(2) Non-Linear of order 1 and degree 1/3

(3) Non-Linear of order 1 and degree 2

(4) Linear of degree 1/3 and order 2

86. If the roots of auxiliary equation are (–500 , –500) then complimentary function is

(1) $(c_1 + c_2 x)e^{-1000x}$

(2) $(c_1 - c_2 x)e^{-1000x}$

(3) $(c_1 + c_2 x)e^{-500x}$

(4) $(c_1 - c_2 x)e^{-500x}$

87. If $Q(x) = e^{50x}$ and $f(50) = 0$ then particular integral is

(1) $\frac{1}{\Phi(50)} e^{-50x} \frac{x^r}{r!}$

(2) $\frac{1}{\Phi(50)} e^{50x} \frac{x^r}{r!}$

(3) $\frac{1}{\Phi(100)} e^{100x} \frac{x^r}{r!}$

(4) $\frac{1}{\Phi(100)} e^{-100x} \frac{x^r}{r!}$

88. Identify the function $p(t)$ and $q(t)$, if the differential equation $\frac{dx}{dt} = \frac{x+t^2-2x\sqrt{t}}{t}$ is written in the form $\frac{dx}{dt} + p(t)x = q(t)$

(1) $p(t) = 2\sqrt{t} - 1, q(t) = t^2$

(2) $p(t) = -1 - 2\sqrt{t}, q(t) = t$

(3) $p(t) = \frac{2\sqrt{t}-1}{t}, q(t) = 1$

(4) It is not possible to write the equation in the form described.

89. Classify the differential equation $e^x \frac{dy}{dx} - 5y = x^2 y$ as

(1) separable and not linear

(2) linear and not Separable

(3) both Separable and linear

(4) neither Separable and nor linear

90. Let $f(x) = \begin{cases} 1 & if\ x\ is\ irrational \\ 0 & if\ x\ is\ rational \end{cases}$ then

(1) f(x) is Lebesgue integrable and Riemann integrable

(2) f(x) is Lebesgue integrable but not Riemann integrable

(3) f(x) is not Lebesgue integrable but is Riemann integrable

(4) None of the above

91. The set of discontinuity of the function $f: [-1,1] \to \mathbb{R}$

Defined by

$f(x) = \begin{cases} x & if\ x\ is\ irrational \\ 0 & if\ x\ is\ rational \end{cases}$ is

(1) Compact

(2) Connected

(3) Closed

(4) Uncountable

92. $\lim_{x \to 0} x \sin \frac{1}{x} =$

(1) π

(2) 1

(3) 0

(4) Does not exist

93. Let $f: \mathbb{R}^+ \to \mathbb{R}^+$ be a monotone decreasing function with

$$\int_0^\infty f(x)\,dx < \infty$$

Then $\lim_{x\to 0} x\,f(x)$ is equal to

(1) 0 (2) 1

(3) $\frac{\pi}{2}$ (4) ∞

94. The value of the integral

$$\frac{1}{\pi}\int_{-\pi}^{\pi} x^3 \cos nx\,dx \text{ is}$$

(1) 0 (2) π

(3) 2π (4) 3π

95. A function f is defined by

$$f(x) = x^p \cos\left(\frac{1}{x}\right),\ x \neq 0, f(0) = 0$$

What conditions should be imposed on p so that f may be

(i) Continuous at $x = 0$

(ii) Differentiable at $x = 0$

(1) p = 0 (2) p = 1

(3) p > 1 (4) p < 1

96. Find the limit points of the set

$$\left\{1, -1, 1\tfrac{1}{2}, -1\tfrac{1}{2}, 1\tfrac{1}{3}, -1\tfrac{1}{3}, \ldots\ldots\right\}$$

(1) 1 (2) 1 and -1

(3) -1 (4) $1, -1, 0$

97. If $A^3 - 7A^2 + aA + b$ 0 then det A is

(1) b (2) a

(3) -7 (4) 7

98. Given $\begin{bmatrix} -2 \\ -1 \\ 2 \end{bmatrix}$ is an eigen vector of $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ then the corresponding eigen value is

(1) 15 (2) 3

(3) 1 (4) 0

99. Which of the following is true?

(1) The cantor ternary set is measurable

(2) The cantor ternary set is perfect

(3) The cantor ternary set is countable

(4) All of the above

100. If $f: [0,1] \to R$ is defined as

$$f(x) = \begin{cases} x^\alpha & \text{for } 0 < x \quad 1 \\ 0 & \text{for } x = 0 \end{cases}$$

and $-1 < \alpha$ 0 then the value of

$$\lim_{n\to\infty} \int_0^1 f_n(x)\,dx \text{ is}$$

(1) α

(2) $\frac{1}{\alpha+1}$

(3) $\alpha + 1$

(4) None of these

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SPACE FOR ROUGH WORK