CUET PG MATHEMATICS 2024
(IFAS SOLVED PAPER)

Q.1 $\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+y^2}$ is

1. 0
2. $1/2$
3. 1
4. does not exist.

Q.2 Which of the following is (are) correct:

A. If $U = x^2 - y^2$ is real part of an analytic function f(z) then analytic function $f(z) = z + c$

8. Zeros of $\cos z$ is $\pm(2n-1)\frac{\pi}{2}$ where $n = 1,2,3,..$

C. If f is entire and bounded for all values of z in the complex plane, then $f(z)$ is constant throughout the plane.

D. $\int_C \frac{2z+1}{z(z+1)} dz = \pi i$, where $|z| = \frac{1}{2}$

Choose the correct answer from the options given below:

1. B and C Only
2. A,B and C Only
3. B,C and D Only
4. AC and D Only

Q.3 Which of the following statement is not correct?

1. There is a one to one correspondence between any two right cosets of the subgroup H in group G.
2. If H, K are the subgroups of G, then HK is a subgoup of G if and only if $HK = KH$.
3. If H, K are the subgroups of the abelian group G, then HK is a subgroup of G.
4. If H, K are the subgroups of G, then Hn X may or may not be a subgroup of G.

Q.4 Which among the following are the integrating factors of the differential equation $3xy + y^2 + (x^2 + xy)\frac{dy}{dx} = 0$.

(A) x

(B) x^2

(C) $3x$

(D) $\frac{1}{xy(2x+y)}$

Choose the correct answer from the options given below:

1. (A) and (C) only.
2. (A), (C) and (D) only.
3. (A), (B), (C) and (D).
4. (B), (C) and (D) only.

Q.5 $\lim_{n\to\infty} \left[\frac{1}{\sqrt{n^2+1}} + \frac{1}{\sqrt{n^2+2}} + \cdots \ldots \ldots \ldots \ldots + \frac{1}{\sqrt{n^2+n}}\right]$ is equal

1. 0
2. 1

3. 3
4. 3

Q.6 The number of generators of the additive group Z_{36} is
1. 6
2. 12
3. 18
4. 36

Q.7 The term "shadow price" in linear programming is:
1. The cost of adding one unit to objective function.
2. The value of non-negativity constraint
3. The cost of adding on unit to the right hand side of a constraint.
4. The cost of remaining constraint

Q.8 If a vector $\vec{r} = (-4x - 6y + 3z)\hat{\imath} + (-2x + y + -5z)\hat{\jmath} + (5x + 6y + az)\hat{k}$ is solenoidal then values of 'a' is
1. 1
2. 2
3. 3
4. 5

Q.9 Which of the following are true?
(A) Let $G = \langle a \rangle$ be a cyclic group of order n, then $G = \langle a^k \rangle$ if and only if $gcd(k, n) = 1$
(B) Let G be a group and let a be an element of order n in G. If $a^k = e$ then n divides k.
(C) The centre of a group G may not be a subgroup of the group G.
(D) For each 'a' in a group G, the centralizer of 'a' is a subgroup of group G
Choose the correct answer from the options given below:
1. (A), (B) and (D) only.
2. (A), (B) and (C) only.
3. (A), (B), (C) and (D).
4. (B), (C) and (D) only.

Q.10 Let S denote the set of all real numbers except -1. Define the binary operation on S as $a * b = a + b + ab$ Then the solution of the equation $2 * x * 3 = 7$ is
1. $-\frac{1}{3}$
2. $-\frac{1}{2}$
3. $\frac{7}{5}$
4. $\frac{7}{6}$

Q.11 Let V and W be the subspaces of R^4 defined as
$V = \{(a, b, c, d): b - 5c + 2d = 0\}, W = \{a, b, c, d\}: a - d = 0, b - 3c = 0$ then the dimension of $V \cap W$.

1. 1
2. 2
3. 3
4. 4

Q.12 Match List-I with List-II

List – I Differential Equation	List – II Particular Integral (P.I.)
(A) $(D^2+6D+9)y=e^x$	(I). $\frac{2}{13}e^x\sin 2x+\frac{10}{13}e^x\cos 2x$
(B) $(D^2-3D-4)y=2\sin x$	(II). $\frac{e^x}{16}$
(C) $(D^2-3D-4)y=-8e^x\cos 2x$	(III). $\frac{-5}{17}\sin x+\frac{3}{17}\cos x$
(D) $(D^2-3D-4)y=2e^{-x}$	(IV) $\frac{-2}{5}xe^{-x}$

Choose the correct answer from the options given below:
1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (II), (B) - (III), (C) - (I), (D) - (IV)
3. (A) - (III), (B) - (II), (C) - (IV), (D) - (I)
4. (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

Q.13 Ler F be a field of order 16384 then the number of proper subfields of F is:
1. 6
2. 3
3. 4
4. 8

Q.14 The area of the portion of the surface $z=x^2-y^2$ in R^3 which lies inside the solid cylinder $x^2+y^2\leq 1$ is
1. $\frac{2\pi}{3}\left(5\sqrt{5}-1\right)$
2. $\frac{\pi}{8}\left(5\sqrt{5}-1\right)$
3. $\frac{\pi}{6}\left(5\sqrt{5}-1\right)$
4. $\frac{\pi}{12}\left(5\sqrt{5}-1\right)$

Q.15 If the vector $v=(4,9,19)$ as a linear combination of $u_1=(1,-2,3), u_2=(3,-7,10), u_3=(2,1,9)$ then which one of the following is correct
1. $v=3u_1+4u_2-2u_3$
2. $v=4u_1-2u_2+3u_3$
3. $v=4u_1+2u_2-3u_3$
4. $v=u_1+2u_2-3u_3$

Q.16 Match List-I with List-II

List – I Series	List – II Radius of convergence

(A). $\sum\left(\frac{1z-1}{2+i}\right)^n$	(I). 0
(B). $\sum(2^{-1}z^2)^n$	(II). $\sqrt{5}$
(C). $\sum(n+2i)^n z^n$	(III). 1
(D) $\sum\left(1+\frac{1}{n}\right)^n z^n$	(IV). $\sqrt{2}$

Choose the correct answer from the options given below:

1. (A) - (1), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (1), (B) - (III), (C) - (II), (D) - (IV)
3. (A) - (II), (B) - (IV), (C) - (I), (D) - (III)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Q.17 A body originally at $60°C$ cools down to $40°C$ in 15 minutes when kept in air at a temperature at $25°C$. What will be the temperature of body at the end of 30 minutes?

1. $15°C$
2. $30°C$
3. $31.42°C$
4. $61.42°C$

Q.18 The equation $\sin z = 10$ has

1. unique solution
2. exactly two distinct complex solutions
3. Infinitely many complex solutions
4. no solution

Q.19 The area of the region bounded by the curves $y = e6x$ and $x = 1$ in the first quadrant is:

1. $e - 3$
2. $e^2 - 1$
3. $e/2$
4. $e - 1$

Q.20 The value of the integral $\int_0^\infty e^{-x^2} dx$ is:

1. $\frac{\pi}{2}$
2. $\frac{3\pi}{2}$
3. $\frac{\sqrt{\pi}}{2}$
4. $\frac{5\sqrt{\pi}}{2}$

Q.21 If the volume of the solid in R^3 bounded by the surfaces $x = -1, x = 1, y = -1, y = 1, z = 2, y\&2 + z^2 = 2$ is $a - \pi$ then a is equal to

1. 2
2. 3
3. 6
4. -6

Q.22 The differential equation $121\frac{d^2y}{dx^2} - 2\tan(x+y)\frac{dy}{dx} + 16y = 2e^{x^2}$ is

1. second order linear homogeneous equation
2. second order non-linear homogeneous equation
3. second order linear non-homogeneous equation
4. second order non-linear non-homogeneous equation

Q.23 Which of the following is(/are) correct:

(A). $\begin{bmatrix}1 & 1\\0 & 0\end{bmatrix}$ is diagonisable but non-invertible matrix.

(B). $\begin{bmatrix}1 & 1\\0 & 1\end{bmatrix}$ is non-diagonisable but invertible matrix.

(C) $\begin{bmatrix}1 & 1\\0 & 1\end{bmatrix}$ is diagonisable and invertible matrix.

(D. $\begin{bmatrix}1 & 1\\0 & 0\end{bmatrix}$ is non-diagonisable and non-invertible matrix.

Choose the correct option from the options given below:

1. (A), (B) and (C) only.
2. (A) and (B) only.
3. (A), (C) and (D) only
4. (A), (B), (C) and (D).

Q.24 The orthogonal trajectory of the equation $x^2 + y^2 = C$ where C is an arbitrary constant,is:

1. $y = C/x$
2. $y = Cx$
3. $x^2 - y^2 = C$
4. $y = Cx^3$

Q.25 Consider the following statements where X and Y are $n \times n$ matrices with real entries then which of the following is/are) correct::

(A). If $P^{-1}XP$ is diagonal matrix for some real invertible matrix P, then there exists a basis for R^n consisting of eigenvectors of X.

(B). If X is diagonal matrix with distinct diagonal entries and $XY = YX$, then Y is also diagonal matrix.

(C). If X^2 is diagonal matrix, then X is diagonal matrix.

(D). If X is diagonal matrix and $XY = YX$ for all Y, then $X = \lambda$ for some $\lambda \in R$

Choose the correct answer from the options given below:

1. (A), (B) and (D) only.
2. (A), (B) and (C) only.
3. (A), (B). (C) and (D).
4. (B). (C) and (D) only.

Q.26 If $f(z)$ is an analytic function within and on a simple closed contour cand a is any point inside c, then the integral $\int_C \frac{f(z)}{(x-a)^2}dz$ is equivalent to:

1. $\int_C \frac{f'(z)}{(x-a)^3}dz$
2. $\int_C \frac{f'(z)}{(x-a)}dz$

3. $\frac{1}{2\pi i}\int_C \frac{f'(z)}{(x-a)^2}dz$

4. $3\pi i \int_C \frac{-f'(z)}{(z-a)^2}dz$

Q.27 Which of the following is correct? (where C-R equation means Cauchy Riemann Equation)

1. The C-R equation are only satisfied by constant function.
2. If $F(z)$ is differentiable at a point then C-R equation must be satisfied at that point.
3. The C-R equations are only used for real valued functions
4. The C-R equations are only applicable to polynomials.

Q.28 Let f be the function on [0, 1] defined by

$$f(x) = \begin{cases} (-1)^r, if \frac{1}{r+1} \leq x < \frac{1}{r}, & r = 1,2,3 \ldots \ldots \\ 0, if & x = 0 \\ 1, if & x = 1 \end{cases}$$

then which of the following is/are) correct:

(A) $f(x)$ is continuous at $x = 1/2$

(B) $f(x)$ is continuous on $[0,1]$.

(C) $f(x)$ is discontinuous at $1/2$.

(D) $f(x)$ is continuous on $(1/2, 1)$

Choose the correct answer from the options given below.

1. (A) only.
2. (B) only.
3. (A), (B) and (D) only.
4. (C) and (D) only.

Q.29 The LPP $\max z = 2.5\, x_1 + x_2$ subjected to contraints $\begin{matrix} 3x_1 + 5x_2 \leq 15 \\ 5x_1 + 2x_2 \leq 10 \\ x_1, x_2 \geq 0 \end{matrix}$ has

1. Unique value of $Maxz$ with unique solution
2. Unique value of $Maxz$ with infinite number of feasible solution
3. No solution
4. Unbounded soulution

Q.30 Match List-I with List-II

List – I	List – II
(A). Set of all even integers	(I). field
(B). Set $\{a + ib: a, b \in z\}$	(II). Integral domain
(C). Set of rational numbers	(III). Non – Commutative ring
(D). Set $S = \left\{\begin{bmatrix} 0 & x \\ 0 & y \end{bmatrix} x, y \in Q\right\}$	(IV). Commutative ring

Choose the correct answer from the options given below:

1. (A) - (IV), (B) - (II), (C) - (III), (D) - (I)
2. (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

3. (A) - (III), (B) - (I), (C) - (IV), (D) - (II)
4. (A) - (IV), (B) - (II), (C) - (1), (D) - (III)

Q.31 The vectors $\vec{\imath} + 2p\vec{\jmath} + 4q\vec{k}$ and $\vec{\imath} + 4p\vec{\jmath} + 2q\vec{k}$ are
1. orthogonal if $p = q$
2. orthogonal if $p = -q$
3. orthogonal if $p^2 = q^2$
4. never orthogonal

Q.32 Consider the following system of linear equations $x + y + 5z = 3, x + 2y + mz = 5$ and $x + 2y + 4z = k$. The system is consistent if
(A) $m \neq 4$
(B) $k \neq 5, m = 4$
(C) $m = 4, k = 1$
(D) $m = 4, k = 5$
Choose the correct answer from the options given below:
1. (A), (B) only.
2. (A),(D) only.
3. (B), (C) only.
4. (C) only.

Q.33 If a linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^3$ is defined by $T(1,2) = (3,2,1)$ and $T(3,4) = (6,5,4)$, then $T(1,0) =$
1. $(0,1,2)$
2. $(1,0,2)$
3. $(-1,0,2)$
4. $(2,1,-1)$

Q.34 Match List-I with List-II

List – I Family of curves	List – II Differential Equations
(A). $y = mx, m$ is arbitrary constant	(I). $2Y^2 - x^2 = \frac{4xydy}{dx}$
(B). $(x-a)^2 + 2y^2 = a^2, a$ is arbitrary constant	(II) $ydx - xdy = 0$
(C). $y^2 = 4ax, a$ is arbitrary constant	(III) $y^2 = \frac{2xydy}{dx}$
(D). $y = a\cos(x+b)$, a and b are arbitrary constant	(IV) $\frac{d^2y}{dx^2} + y = 0$

Choose the correct answer from the options given below:
1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
3. (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Q.35 The function $\varphi(x,y,z) = xy + yz + xz$ is a potential for the vector field $\vec{F} =$
(A). $(y+z)\hat{\imath} + (x+z)\hat{\jmath} + (x+y)\hat{k}$

(B). $(x+y)\hat{\imath}+(y+z)\hat{\jmath}+(x+z)\hat{k}$
(C). $(x+z)\hat{\imath}+(x+y)\hat{\jmath}+(y+z)\hat{k}$
Choose the correct answer from the options given below:
1. (B) only.
2. (C) only.
3. (B) and (C) only.
4. (A) only.

Q.36 If the eigen values of a 3×3 matrix are 6,5 & 2 what is the determinant of $(A^{-1})^T$.
1. 0.005
2. 0.0087
3. 0.506
4. 0.016

Q.37 Which of the following statement is not correct?
1. Every convergent sequence is bounded.
2. Every infinite bounded sequence has a limit point.
3. In the field of real numbers, a sequence is convergent if and only if it is a Cauchy sequence.
4. A bounded sequence which does not converge has a unique limit point.

Q.38 Which of the following is a subspace of $\mathbb{R}^3$?
1. $W=\{(x,y,z)\in\mathbb{R}^3: x+4y-10z=-2\}$
2. $W=\{(x,y,z)\in\mathbb{R}: xy=0\}$
3. $W=\{(x,y,z)\in\mathbb{R}^3: 2x+3y-4z=0\}$
4. $W=\{(x,y,z)\in\mathbb{R}^3: x\in\mathbb{Q}\}$

Q.39 If $z=x^2-xy+y^3, x=r\cos\theta, y=r\sin\theta$ then $\left(\frac{\partial z}{\partial r}\right)_{x=1,y=1}$ equals
1. $\frac{3}{\sqrt{2}}$
2. $\frac{1}{\sqrt{2}}$
3. $\sqrt{2}$
4. 1

Q.40 The solution of the differential equation $x\frac{dy}{dx}+y=x^3y^6$ is: (where C is an arbitary constant)
1. $y^{-5}x^{-5}=\frac{5}{2}x^{-2}+C$
2. $y^{-5}x^{-2}=\frac{5}{2}x^{-2}+C$
3. $y^{-5}x^{-5}=\frac{5}{2}x^{-5}+C$
4. $y^{-2}x^{-5}=\frac{5}{2}x^{-2}+C$

Q.41 Determine the nature of the transformation of the expressions
$w_1=\frac{3iz+4}{z-i}$ and $w_2=\frac{z}{z-7}$
(A) w_2 is hyperbolic

(B) w_1 is parabolic
(C) w_2 is loxodromic
(D) w_1 is loxodromic
Choose the correct answer from the options given below:
1. (A) and (D) only.
2. (B) and (C) only.
3. (C) and (D) only
4. (A) and (B) only.

Q.42 Tricomi's equation
$U_{xx} + Xu_{yy} = 0$ is:
1. Elliptic for $x < 0$
2. hyperbolic for $x < 0$
3. Parabolic for $x > 0$
4. Both parabolic & hyberbolic for $x > 0$

Q.43 Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation defined by $T(x, y) = (x, x + y, y)$.The rank(T) is:
1. 0
2. 1
3. 3
4. 2

Q.44 Which of the following statements is/are correct?
(A) A closed set either contains an interval or else is nowhere dense.
(B) The derived set of a set is closed.
(C) The union of a arbitrary family of closed sets is closed.
(D) The set R of real numbers is open as well as closed.
Choose the correct answer from the options given below:
1. (A), (B) and (D) only.
2. (A), (B) and (C) only.
3. (A), (C) and (D) only.
4. (B), (C) and (D) only.

Q.45 Consider the Linear Programming Problem (LPP):
Maximize $z = 2x + y$
subject to the constraints:
$3x - 7y \leq 21$
$y - 2x \leq 10$
$x, y \geq 0$. Then
1. The LPP admits a unique solution with an optimal value of Z.
2. The LPP is unbounded
3. The LPP admits infinite number of feasible solution with same optimal value of Z.
4. The LPP admits no feasible solution

Q.46 Let $h(x) = 1 + x, g(x) = (1 + x)^{\frac{1}{2}}. f(x) = 1 - x, k(x) = (1 - x)^{\frac{1}{2}}$

Match List-I with List-II

List – I (Points of differentiability)	List – II (function)
(A). all reals > -1	(I) kof
(B). all reals < 2	(II) goh
(C). all reals > -2	(III) gof
(D) all reals > 0	(IV) hog

Choose the correct answer from the options given below:
1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
3. (A) - (Iv), (B) - (III), (C) - (II), (D) - (I)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Q.47 Consider the linear programming problem (LPP)
Maximize $z = -x_1 + 4\,x_2$
subject to $3x_1 - x_2 \geq -3$,
$-0.3\,x_1 + 1.2\,x_2 \leq 3$,
$x_1, x_2 \geq 0$ then which of the following is correct?
1. The LPP has an unbounded solution.
2. The LPP does not have an optimal solution.
3. The LPP has no feasible region.
4. The LPP has finite optimal solution.

Q.48 The solution of $x \log x \frac{dy}{dx} + y = 4 \log x$ is
1. $y = 4 \log x + c/\log x$: c is an arbitrary constant.
2. $y = log + c/\log x$: c is an arbitrary constant.
3. $y = 2 \log x + c/\log x$: c is an arbitrary constant.
4. $y = 4 \log x + \frac{c}{4 \log x}$: C is an arbitrary constant.

Q.49 Let W be a solution space of the differential equation $\frac{d^2y}{ax^2} + 6\frac{d^2y}{ax^2} + 11\frac{dy}{ax} + 6y = 0$. Then dimension of the solution space W is
1 .3
2. 2
3. 1
4. 4

Q.50 The line integral of $\int_C (1 + x^2 y)ds$, where the curve C is given by $\vec{r}(t) = \sin t\hat{\imath} + \cos t\hat{\jmath}\left(0 \leq t \leq \frac{\pi}{2}\right)$ is
1. $\pi/2$
2. 0
3. $\frac{\pi}{2} + \frac{1}{3}$

4. $\frac{\pi}{2} - \frac{1}{3}$

Q.51 The points on the sphere $x^2 + y^2 + z^2 = 1$ which are at the maximum and minumum distance from the point (3,4,12) are:

1. point $A(4/13,12/13,4/13)$ at maximum distance and point $B(-3/13,-4/13,-12/13)$ at minimum distance
2. point $A(3/13,4/13,12/13)$ at minimum distance and point $B(-3/13,-4/3-12/13)$ maximum distance
3. point $A(4/13,12/13,4/13)$ at minimum distance and point $B(-3/13,-4/13,-12/13)$ at maximum distance
4. point $A(12/13,-12/13,-4/13)$ at minimum distance and point $B(-3/13-4/13-12/13)$ at maximum distance

Q.52 List I consists of double integrals and List-II consists of double integrals after changing the order of integration.

Match List-I with List-II

List – I	List – II
(A). $\int_0^2 \int_0^x f(x,y)dydx$	(I) $\int_0^1 \int_z^1 f(x,y)dydx$
(B). $\int_0^1 \int_y^1 f(x,y)dxdy$	(II) $\int_0^1 \int_0^x f(x,y)dydx$
(C). $\int_0^2 \int_z^2 f(x,y)dydx$	(III) $\int_0^2 \int_y^2 f(x,y)dxdy$
(D). $\int_0^1 \int_0^y f(x,y)dxdy$	(IV) $\int_0^2 \int_0^y f(x,y)dxdy$

Choose the correct answer from the options given below:

1. (A) - (IV), (B) - (I), (C) - (II), (D) - (III)
2. (A) - (III), (B) - (II), (C) - (IV), (D) - (I)
3. (A) - (III), (B) - (II), (C) - (I), (D) - (IV)
4. (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

Q.53 For a position vector $\vec{r} = x\vec{\imath} + y\vec{\jmath} + z\vec{k}$ the norm of a vector can be defined as $|\vec{r}| = \sqrt{x^2 + y^2 + z^2}$ Given $\Phi = \ln|\vec{r}|$, then gradient Φ is

1. $\vec{r}$
2. $\frac{\vec{r}}{|\vec{r}|}$
3. $\frac{\vec{r}}{\vec{r}.\vec{r}}$
4. $\frac{r}{|\vec{r}|^3}$

Q.54 If u is homogeneous function of degree n, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = nu$. The above statement is:

1. Lagrange's theorem
2. Euler's Theorem
3. Cauchy theorem
4. Taylor's theorem

Q.55 The directional derivative of $\Phi(x,y,z) = x^2yz + 4xz^2$ at $(1,-2,1)$ in the direction of $2\hat{\imath} - \hat{\jmath} - 2\hat{k}$ is

1. $-\frac{13}{3}$
2. $\frac{1}{3}$
3. $-\frac{1}{13}$
4. $\frac{13}{9}$

Q.56 Which of the following is/are) correct:

(A). Every permutation of a finite set can be written as a cycle or as a product of disjoint cycles.

(B). The order of a permutation of a finite set is the greatest common divisor of the length of the cycles.

(C) Every permutation of length $n > 1$, is product of 2-cycles

Choose the correct answer from the options given below:

1. (A) and (B)only
2. (B) only
3. (A) and (C)
4. (A), (B) and (C)

Q.57 For the subset $S = \{(1,0,0),(0,1,0),(0,0,1),(1,1,1),(1,1,0))$ in $\mathbb{R}^3$ which of the following is(/are) correct:.

(A). S is a linearly dependent set.

(B). Any three vectors of S are linearly independent.

(C).Any four vectors of S are linearly dependent.

Choose the correct answer from the options given below:

1. (B) and (C) only.
2. (A), (B) and (C).
3. (A) and (C) only.
4. (A) and (B) only.

Q.58 Which of the following statement(s) is/are correct:

(A). A polynomial is monic if its leading coefficient is 1.

(B). Every square matrix is a zero of its characteristic polynomial.

(C). The characteristic and minimal polynomial of a matrix A do not have the same irreducible factors.

(D). The similar matrices have the same characteristic polynomial.

Choose the correct answer from the options given below.

1. (A), (B) and (D) only.
2. (A) and (D) only.
3. (B). (C) and (D) only.
4. (B) only.

Q.59 Match List-I with List-II

List – I function	List – II Property
(A). $\log z$	(I). is not harmonic function
(B). e^x	(II). is not analytic function
(C). $\left(\frac{1}{2}\right)\log(x^2+y^2)$	(III). Is analytic function except $z=0$
(D). $xy+iy$	(IV). Is harmonic function

Choose the correct answer from the options given below:

1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (III), (B) - (I), (C) - (IV), (D) - (II)
3. (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Q.60 For which value of k, the function $f(x)=\begin{cases}kx^2, x\geq 1\\ 4, x<1\end{cases}$ continuous at $x=1$?

1. $k=1$
2. $k=2$
3. $k=3$
4. $k=4$

Q.61 The matrix A whose minimal polynomial is $f(t)=t^3-8t^2+5t+7$ is:

1. $\begin{bmatrix}0 & 0 & 7\\ 1 & 0 & 5\\ 0 & 1 & 8\end{bmatrix}$
2. $\begin{bmatrix}1 & 0 & 8\\ 0 & 0 & 5\\ 0 & 1 & 7\end{bmatrix}$
3. $\begin{bmatrix}0 & 0 & -7\\ 1 & 0 & -5\\ 0 & 1 & 8\end{bmatrix}$
4. $\begin{bmatrix}0 & 0 & 7\\ 1 & 0 & 5\\ 0 & 1 & -8\end{bmatrix}$

Q.62 The series $\sum_{n=0}^{\infty}\frac{x^n}{x+n}, (x>0)$

(A). converges if $x<1$

(B). diverges if $x>1$

(C). diverges if $x\geq 1$

(D). converges if $x\leq 1$

Choose the correct answer from the options given below:

1. (A) and (B) only.
2. (B) only.
3. (A) and (C) only.
4. (B) and (D) only.

Q.63 If $\int_0^{2a}x^3\sqrt{2ax-x^2}dx=\frac{p}{q}\pi a^5$ then p^2+q^2 is equal to

1. 113

2. 103
3. 131
4. 301

Q.64 If $u = \log(x^3 + y^3 + z^3 - 3xyx)$ and $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = \frac{m}{x+y+z}$ then m^2 is equal to

1. 1
2. 3
3. 9
4. 4

Q.65 Let W be the wronskian of two linearly independent solutions of differential equation $2y'' + y' + t^2y = 0: t \in R$ Then for all t, there exists a constant $C \in R$ such that W(t) is

1. Ce^{-t}
2. $Ce^{-\frac{t}{2}}$
3. Ce^{2t}
4. Ce^{-2t}

Q.66 The value of the integral $\oint_C \frac{e^z}{z^3-1} dz, C$: a triangle with vertices at 0, $\pm\frac{1}{4}$ is:

1. $\frac{\pi}{4}$
2. 1
3. 0
4. 3

Q.67 The function $f(z) = |z|^2$ is

1. continuous everywhere and differentiable everywhere
2. continuous everywhere but differentiable only at the origin $(Z = 0)$
3. discontinuous at the origin and differentiable everywhere except at the origin $(Z = 0)$
4. nowhere differentiable and nowhere continuous

Q.68 The value of integral $\int_C' \frac{e^z}{(z-1)(z-4)} dz$ where C is the circle $|z| = 2$ is

1. $\frac{\pi ie}{3}$
2. $\frac{2\pi ie}{3}$
3. $-\frac{2\pi ie}{3}$
4. $\frac{\pi ie}{4}$

Q.69 Which of the following function satisfy Rolle's theorem?

1. $f(x) = \sin x, x \in [0,2\pi]$
2. $f(x) = |x|, x \in [-1,1]$
3. $f(x) = |x - 1|, x \in [-2,2]$
4. $f(x) = \frac{1}{x}, x \in [-1,1]$

Q.70 The image of closed interval under a continuous function is
1. Closed interval
2. Either closed interval or open interval
3. Open interval
4. Closed interval or a singleton

Q.71 Which of the following is/are) correct:
(A). All functions in LPP are linear.
(B). The set of all optimal solutions of LPP need not to be convex.
(C). Every point lying on the line segment joining two optimal solutions to a LPP is also optimal solution.
(D). The optimal solutions of an LPP always exist.
Choose the correct answer from the options given below:
1. (A), (B) and (D) only.
2. (A), (B) and (C) only.
3. (A), (B), (C) and (D).
4. (B), (C) and (D) only.

Q.72 The flux of $\vec{F} = yi - x\hat{j} + z^2\hat{k}$ along outward normal, across the surface of the solid $\left\{(x, y, z) \in R^3 | 0 \leq x \leq 1, 0 \leq y \leq 1, 0 \leq z \leq \sqrt{2 - x^2 - y^2}\right\}$ is equal to
1. 2/3
2. 5/3
3. 8/3
4. 4/3

Q.73 Match List-I with List-II

List – I	List – II
(A). The unit normal to the surface $x^3 - xyz + z^3 = 1$ at $(1,1,1)$	(I). $\hat{k}$
(B). If $\phi = \frac{y}{x^2+y^2}$, $(\nabla\phi)\|(1,0) =$	(II). $\hat{j}$
(C). If $\vec{F} = x^2\hat{\imath} + 2z^2\hat{\jmath} - 3y^2\hat{k}$, $(\nabla \times \vec{F})\|(0,-1,-1)$	(III). $10\hat{\imath}$
(D) If $\phi = \frac{y}{x^2+y^2}$, $(\nabla\phi)\|(0,1) \times \hat{\imath} =$	(IV). $\frac{1}{3}\left(2\hat{\imath} - \hat{\jmath} + 2\hat{k}\right)$

Choose the correct answer from the options given below:
1. (A) - (IV), (B) - (II), (C) - (III), (D) - (I)
2. (A) - (I), (B) - (II), (C) - (II), (D) - (IV)
3. (A) - (IV), (B) - (II), (C) - (I), (D) - (III)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Q.74 For an analytic function $f(z)$ on domain D which of the following is(/ are) correct:
(A).if Real part of $f(z)$ is constant then $f(z)$ is constant function.
(B).If $|f(z)| = 0$ is a non zero constant in D, then $f(z)$ is constant function in D.
(C).If $f'(z) = 0$ everywhere in D then $f(z)$ is constant function in D
(D).if $|f(z)|$ is a non zero constant in D, then f(z) is constant only some z in D.

Choose the correct answer from the options given below:

1. (A), (B) and (C) only.
2. (A), (C) and (D) only.
3. (A) and (D) only.
4. (D) only.

Q.75 The set on which $f(x) = x^2$ is uniformly continous is

(A). $[-1,1]$

(B). $(-1,1)$

(C). $\mathbb{R}$

(D). Nowhere

Choose the correct answer from the options given below:

1. (A) and (B) only
2. (A) and (C) only
3. (C) only
4. (A), (B) and (C) only