openhed at 2:20 Used for upl (DO NOT OPEN THE A	oading on University To SQUESTION BOOKLET BEF ARE ASKED TO DO SO PG-EE-June, 202	Debsite Material failt Debsite Material failt Dial No. of Frinted Pages : 21 ORE TIME OR UNTIL YOU SET-X
SU	BJECT : Mathematics	Group 10453 Sr. No.
Time : 1¼ Hours Roll No. (in figures)	Max. Marks : 100 (in words)	Total Questions : 100
Name	Date of Birth	
Father's Name	Mother's Name	
Date of Examination		
(Signature of the Candid	ate)	(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are compulsory.

- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfairmeans / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
- 4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
- 5. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- 6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)



(1) *n*-arbitrary constants

A

- (2) more than n-arbitrary constants
- (3) any number of arbitrary constant
- (4) none of these
- **2.** General solution of $\frac{dy}{dx} + 2xy = 2e^{-x^2}$ is :
 - (1) $y = (2x+c)e^{-x^2}$ (2) $y = 2xe^{-x}$ (3) $y = e^{-x}$ (4) none of these
- The necessary condition for the equation M(x, y)dx + N(x, y)dy = 0, to be exact is : 3.
 - (1) $\frac{\partial N}{\partial y} = \frac{\partial M}{\partial x}$ (2) $\frac{\partial N}{\partial y} = -\frac{\partial M}{\partial x}$ (4) $\frac{\partial M}{\partial y} = -\frac{\partial N}{\partial x}$ (3) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$
- The equation ydx + xdy = 0 is : 4.
 - (1) Partial differential equation
 - (2) Exact differential equation
 - (3) Non-exact differential equation
 - (4) None of these
- 5. For the differential equation $x \frac{dy}{dx} y = 0$, which of the following function is not an integrating factor ?
 - (3) $\frac{1}{xy}$ (4) $\frac{1}{x+y}$ (2) $\frac{1}{v^2}$ (1) $\frac{1}{r^2}$

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)



2

- (1) \vec{a} is parallel to \vec{b}
- (2) \vec{a} is at right angle to \vec{b}
- (3) either \vec{a} or \vec{b} is a null vector
- (4) none of these

7. The unit normal vector to the surface $x^4 - 3xyz + z^2 + 1 = 0$ at the point (1, 1, 1) is :

- (1) $\frac{i+3j+k}{\sqrt{\pi}}$ (2) $\frac{i-3j-k}{\sqrt{\pi}}$
- (3) $\frac{i+3j-k}{\sqrt{2}}$ (4) None of these

8. A vector \vec{f} is called an irrotational vector if :

- (1) div curl $\vec{f} = 0$ (2) $\nabla \cdot \vec{f} = 0$ (3) $\nabla \times \vec{f} = 0$ (4) none of these
- Which of the following is *not* true ? 9.
 - (1) curl (grad ϕ) = 0 (2) div (grad ϕ) = 0 (3) div (curl \vec{f}) = 0 (4) curl $(\overrightarrow{r}) = 0$

Which of the following is related with Stoke's theorem ? 10.

- (1) A line integral and a volume integral
- (2) A surface integral and a volume integral
- (3) A line integral, a surface integral and a volume integral
- (4) A line integral and a surface integral

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

Δ

				3
11.	The remainder in the divison of 2^{20} by	7 is :		
	(1) 0 (2) 1	(3) 2	(4) 4	
12.	Every natural number greater than one	has at least :		
	(1) one prime factor	(2) two prime facto	or	
	(3) two composite factors	(4) none of these		
13.	Find the highest power of 7 contained in	n 1000!		
	(1) 264 (2) 164	(3) 64	(4) none of these	
14.	If $ \cos(\alpha - i\beta) = 1$, then $\sin^2 \alpha$ is equal	l to :		
	(1) $\cos h^2 \beta$	(2) $\sin h^2 \beta$		
	(3) $\tan h^2\beta$	(4) none of these		
15.	If <i>p</i> is a prime number then $(p - 1)! + 1 \equiv$	$0 \pmod{p}$ is the stat	ement of :	
	(1) Chinese remainder theorem		I all all all all a little . All	
	(2) Fermat's theorem			
	(3) Wilson's theorem			
	(4) Reduced residue theorem			
16.	If <i>A</i> is a non-singular matrix of order <i>n</i> ,	then adj (adj A) is ec	qual to :	
	(1) $ A ^{n+1} A$	(2) $ A ^n A$		
	(3) $ A ^{n-1} A$	(4) $ A ^{n-2} A$		
17.	The vectors $\begin{bmatrix} 2\\0\\k \end{bmatrix}, \begin{bmatrix} 3\\-1\\5 \end{bmatrix}, \begin{bmatrix} 5\\-1\\1 \end{bmatrix}$ are linearly	dependent, then val	ue of k is equal to :	
	(1) -4 (2) -2	(3) 0	(4) 4	

G-EE-June, 2023/(Mathematics)(SET-X)/(A)



A **18.** The characteristics roots of a Hermitian matrix are : (1) Imaginary (2) Real (3) Complex number (4) None of these **19.** Determinant of an idempotent matrix equals : (1) 1 (2) 0(3) 1 or 0 . (4) none of these 20. The common roots of the equations $x^4 + 3x^3 - 5x^2 - 6x - 8 = 0$ and $x^4 + x^3 - 9x^2 + 10x - 8 = 0$ are: (4) -4, 2 (1) 2, 3 (2) 3, 4 (3) 4,0 **21.** The value of $\lim_{x \to 0} (1+2x)^{\frac{x+5}{2}}$ is : (2) e^2 (1) $\frac{e}{2}$ (4) e^{10} (3) e^5 **22.** Area bounded by the parabola $2y = x^2$ and the line x = y - 4 is equal to : (1) 6 (2) 18 (3) ∞ (4) none of these **23.** The radius of curvature at the origin of the curve $x^2 + 6y^2 + 2x - y = 0$ is : (2) $\frac{1}{3\sqrt{5}}$ (3) $\frac{1}{2\sqrt{5}}$ (4) $\frac{1}{\sqrt{5}}$ (1) $\frac{1}{5\sqrt{2}}$ The nature of double points on the curve $(y - x)^2 + x^7 = 0$: 24. (1) a cusp (2) a node (4) none of these (3) conjugate point The asymptotes of the curve $r \cos \theta = a \cos 2\theta$: 25. (1) $r\cos\theta + a = 0$ (2) $r \sin \theta + a = 0$ (3) $r \tan \theta + a = 0$ (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

4

26. What is the nature of the curve $13x^2 - 18xy + 37y^2 + 2x + 14y - 2 = 0$? (1) circle (2) sphere (3) hyperbola (4) ellipse The equation of the plane which cuts the paraboloid $x^2 - 2y^2 = z$ in a conic with its 27. centre at the point $\left(2, \frac{3}{2}, 4\right)$ is given by : (1) 3x + 4y + z = 0(2) 2x + 4y - z + 7 = 0(3) 4x - 6y - z + 5 = 0(4) None of these The latus rectum of the parabola $(a^2 + b^2)(x^2 + y^2) = (bx + ay - ab)^2$ is : 28. (1) $\frac{2ab}{\sqrt{a^2 + b^2}}$ (2) $ab \cdot \sqrt{a^2 + b^2}$ (3) $\sqrt{a^2 + b^2}$ (4) none of these **29.** The equation of circle with radius '*a*' and touching the initial line at pole is : (1) $r = a \tan \theta$ (2) $r = 2a \sin \theta$ (3) $r = 2a \cot \theta$ (4) none of these **30.** The points in which the line, $\frac{x+1}{-1} = \frac{y-12}{5} = \frac{z-7}{2}$ cuts the surface $11x^2 - 5y^2 + z^2 = 0$ are : (1) (3, 2, 1), (2, 0, 1)(2) (1, 2, 3), (2, -3, 1)(3) (2, 1, 1), (1, 0, -1)(4) None of these **31.** If $\lim_{x \to 0} \frac{ae^x - b\cos x + ce^{-x}}{x\sin x} = 2$, then value of *b* is equal to : (1) -2(2) -1(3) 0(4) 2

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

P. T. O.

5



32. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then value of $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$ is equal to :

(2) $\frac{1}{x^3 + y^3 + z^3}$ (1) $\frac{1}{x^2 + y^2 + z^2}$ (3) $\frac{3}{x+y+z}$ (4) None of these

The equation of normal to the surface xyz = 4 at the point (1, 2, 2) is equal to : 33.

(1)
$$\frac{X-1}{2} = \frac{Y-2}{1} = \frac{Z-2}{1}$$
 (2) $\frac{X-1}{1} = \frac{Y-2}{2} = \frac{Z-2}{1}$
(3) $\frac{X-1}{3} = \frac{Y-2}{2} = \frac{Z-2}{2}$ (4) None of these

The necessary and sufficient condition for the curve to be a plane curve is : 34.

(2) $\begin{bmatrix} \overrightarrow{r}, \overrightarrow{r}, \overrightarrow{r}, \overrightarrow{r} \end{bmatrix} = 0$ (1) $\begin{bmatrix} \overrightarrow{r} & \overrightarrow{r'} & \overrightarrow{r''} \end{bmatrix} = 0$ (3) $\begin{bmatrix} \overrightarrow{r}, \overrightarrow{r}, \overrightarrow{r} \end{bmatrix} = 0$ (4) none of these

The maximum value of the function $\sin x + \sin y + \sin (\sin x + y)$ is : 35.

(3) $\frac{\sqrt{3}}{2}$ (1) $\frac{3\sqrt{3}}{2}$ (2) $\sqrt{3}$ (4) None of these

A partial differential equation by eliminating the arbitrary functions from : 36. z = f(x-ay) + g(x + ay) is given by :

(2) $\frac{\partial^2 z}{\partial v^2} = a^2 \frac{\partial^2 z}{\partial x^2}$ (1) $\frac{\partial^2 z}{\partial x^2} = \frac{\partial^2 z}{\partial y^2}$ (3) $\frac{\partial^2 z}{\partial r^2} = a^2 \frac{\partial^2 z}{\partial u^2}$ (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

Α



37. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3 \frac{\partial^3 z}{\partial x^2 \partial y} + 4 \frac{\partial^3 z}{\partial x^3} = e^{x+2y}$ is: (3) $\frac{1}{27}e^{x+2y}$ (4) none of these (1) $\frac{1}{8}e^{x+2y}$ (2) $\frac{1}{2}e^{2y}$ **38.** The partial differential equation $\frac{\partial^2 z}{\partial x^2} - 7 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = 0$ is : (2) Parabolic (1) Hyperbolic (4) None of these (3) Elliptic The real characteristics of the partial differential equation $\frac{\partial^2 z}{\partial r^2} + 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial x^2} = 0$ is : 39. (3) 8x - y = 0 (4) y - 2x = c(1) 4x = y + c(2) 3x + y = 0To two dimensional heat equation is given by : 40. (2) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial u} = 8$ (1) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = \frac{1}{c} \frac{\partial u}{\partial t}$ (4) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial u^2} = \frac{1}{c^2} \frac{\partial u}{\partial t}$ (3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial y} = \frac{1}{c^2} \frac{\partial^2 u}{\partial x^2}$ The resolved part of a force *f* in a direction perpendicular to it is : 41. (2) Minimum (1) Maximum (4) 0(3) F Centre of gravity of a thin uniform triangular lamina divides every median in the 42. ratio: (4) 1:4 (3) 2:3(2) 2:1 (1) 1:2P. T. O. PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

A

Scanned with OKEN Scanner

7

43. The force of friction called into play when there is equilibrium is called :

(1) Limiting friction

(2) Dynamical friction

(3) Statical friction

(4) None of these

44. Which type of forces from the couple ?

(1) Two equal and unlike parallel forces with same lines of action.

(2) Two equal and unlike parallel forces with different lines of action.

(3) Two unequal and like parallel forces with different lines of action.

(4) Two unequal and unlike parallel forces with different lines of action.

45. The gravitational unit of moment in S.I. system is :

(1)	Dyne-centimeter	(2)	Newton meter
(1)	Dyne-centimeter	(2)	INCOLUTI

(3) gm. cm

(4) kg. m

46. Every non-empty subset of R which is bounded above must have l.u.b. This result is known as :

- (1) Law of well ordering
- (2) Law of trichotomy
- (3) Completeness axiom
- (4) Archimedian property of real numbers

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)



The g.l.b. of a set : 47.

A

- (1) belongs to the set
- (2) does not belong to the set
- (3) may or may not belong to the set
- (4) none of these
- **48.** If $\sum_{n=1}^{\infty} a_n$ is convergent and the sequence $\langle b_n \rangle$ is monotonic and bounded, then
 - $\sum_{n=1}^{\infty} a_n b_n$ is convergent. This statement is known as :
 - (2) Abel's lemma (1) Abel's test
 - (3) Dirichlet's test
- The series $\sum_{n=1}^{\infty} a_n$, where $a_n = \sqrt{n^4 + 1} \sqrt{n^4 1}$ is : 49.
 - (1) convergent
 - (3) oscillating

(4) none of these

(2) divergent

(4) None of these

- The infinite product $\left(1 \frac{1}{2^2}\right) \left(1 \frac{1}{3^2}\right) \left(1 \frac{1}{4^2}\right)$ is : 50.
 - (1) divergent

(2) convergent

(3) oscillating

- (4) none of these
- Generating function for Bessel function $J_n(x)$ is : 51.
 - (2) $e^{\frac{x}{2}\left(\frac{1}{t}-t\right)}$ (1) $e^{\frac{x}{2}\left(t-\frac{1}{t}\right)}$ (3) $e^{x\left(t-\frac{1}{t}\right)}$ (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

52. Rodrigue formula for Legendre polynomials is :

A

(1)
$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 - 1)^n$$

(2)
$$P_n(x) = \frac{1}{2^n} \frac{d^n}{dx^n} (x^2 - 1)^n$$

(3)
$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 + 1)^n$$

(4) None of these

53. The Laplace transform of $te^{-t} \sin 3t$ is equal to :

(1)
$$\frac{36}{(s^2 + 2s + 10)^2}$$
 (2) $\frac{6(s+1)}{(s^2 + 2s + 10)^2}$
(3) $\frac{s+1}{(s^2 + 2s + 6)^2}$ (4) None of these

54. The generating function of Legendre's polynomials is :

(1) $(1+2xt+t^2)^{3/2}$ (2) $(1+2x+t^2)^{1/2}$

(3) $(1-2xt+t^2)^{-1/2}$ (4) None of these

55. The sine Fourier transform of $2e^{-5x}$ is :

(1)
$$\frac{5s}{s^2 + 4}$$
 (2) $\frac{-5s}{s^2 + 4}$
(3) $\frac{5s}{s^2 + 25}$ (4) None of these

se

O Scanned with OKEN Scanner

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

8

3

Which of the following keyword is used for the storage class? 56. (1) print f (2) external (3) auto (4) none of these **57.** What will be the maximum size of a double variable ? (1) 16 bytes (2) 8 bytes

(3) 4 bytes (4) none of these

The continue command cannot be used with : 58.

> (1) switch (2) for (3) do (4) none of these

59. The bitwise OR operator is used to :

(1) divide number

A

(2) set the desired bits to 0

(3) set the desired bits to 1

(4) none of these

60. C is which kind of language?

- (1) machine (2) assembly
- (3) objected-oriented (4) none of these

61. If f is bounded function defined on [a, b] and P be a partition of f[a, b], then which of the following is odd?

(1) $L(f, P) \le U(f, P)$ (2) L(-f, P) = -U(f, P)(3) U(P, -f) = -L(P, f)(4) U(-f, P) = -U(f, P)

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)



62. Which of the following is *not* a bounded metric ?

- (2) $d(x, y) = \min\{2, |x y|\}$ (1) d(x, y) = |x - y|
- (3) discrete metric

(4) $d^*(x,y) = \frac{d(x,y)}{1+d(x,y)}$

A

where *d* is any metric on *X*.

63. Which one is a dense set ?

- (1) the subset $A = \left\{\frac{1}{n}, n \in N\right\}$ in R
- (2) set of natural number in R
- (3) Q in R

(4) none of these

64. If $f(x) = \frac{1}{x^2}$ on [1, 4] and P = [1, 2, 3, 4] be the partition of [1, 4], then L(f, P) is equal to:

- (3) $\frac{30}{144}$ (1) $\frac{70}{144}$ (2) $\frac{61}{144}$ (4) none of these
- **65.** The integral $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$ is :
 - (1) convergent
 - (4) none of these (3) conditionally convergent
- A sphere (open or closed) is always : 66.
 - (2) non-empty (1) empty
 - (3) singleton set
- (4) none of these

(2) divergent

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)



(1) $A = \overline{A}$ (2) $d(A) \subset A$ (3) A^C is open (4) A = Å**68.** The order of *a* and *x* in a group are respectively 3 and 4. Then the order of $x^{-1}ax$ is : (1) 12 (2) 8 (3) 5 (4) 3 69. Every group is isomorphic to a permutation group. This result is known as : (1) Lagrange theorem (2) Cauchy theorem (3) Cayley's theorem (4) Gauss theorem **70.** The number of conjugacy classes in a group of order 25 is : (1) 1 (2) 5 (3) 25 (4) none of these **71.** The number of non-isomorphic abelian groups of order 8 is : (1) 1 (2) 2(3) 3 (4) none of these **72.** The number of prime ideals of Z_{10} is : (1) 2(2) 1 (3) 0 (4) none of these **73.** The ring of *Z*, *Q*, *R*, *C*, *Z*₅ are : (1) All integral domains (2) None of them is integral domain (3) Some of them is integral domain (4) None of these PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

A



74. Which statement is *wrong*?

F is a field, then F[x] is :

- (1) Euclidean domain
- (2) Principal ideal domain
- (3) Unique factorization domain
- (4) None of these
- **75.** In S. H. M. the maximum velocity is :
 - (1) $V_{\max} = a$

(2) $V_{\text{max}} = \sqrt{\mu} a$

(3) $V_{\text{max}} = \mu a$

(4) None of these

76. The uniform force that will move on kg. mass from rest through one metre in one second is :

(1) 4 Newton

(3) 2 Newton

(4) None of these

(2) 3 Newton

- **77.** At an apse, the radius vector is :
 - (1) perpendicular to the tangent
 - (2) parallel to the tangent
 - (3) perpendicular to the apsidal distance
 - (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)



- The radial and transverse acceleration of a particle moving along a plane curve 78. $r = f(\theta)$ are :
 - (1) $r\frac{dr}{dt}, \frac{d\theta}{dt}$

A

- (2) $\frac{dr}{dt}, r\frac{d\theta}{dt}$
- (3) $\frac{d^2r}{dt^2} r\left(\frac{d\theta}{dt}\right)^2, \frac{1}{r}\frac{d}{dt}\left[r^2\frac{d\theta}{dt}\right]$
- (4) None of these
- **79.** Central force is defined as :
 - (1) A force whose line of action always passes through variable point.
 - (2) A force whose line of action always passes through a fixed point.
 - (3) A force whose line of action does not pass through a fixed point.
 - (4) None of these
- 80. Frequency of a simple harmonic motion is :
 - (2) $\frac{\pi}{\mu}$ (1) $\frac{\mu}{\pi}$ (4) $\frac{\sqrt{\mu}}{2\pi}$ (3) <u>\[\sqrtue\]}{_____}}</u>
- **81.** Co-efficient of the vector (5, -1, 2) w. r. t. basis (1, 4, 2), (4, 2, 1), (2, 1, 3) are :
 - (2) (-1, 1, 1)(1) (1, 1, 1)
 - (4) None of these (3) (1, 2, 3)

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

82. Which is an orthogonal set ? (1) {(1, 0, 1), (1, 0, -1), (0, 1, 0)} $(2) \{(1, 0, 1), (1, 0, -1), (0, 3, 4)\}\$ (3) {(1, 0, 1), (1, 0, -1), (-1, 0, 1)} (4) None of these **83.** Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be linear transformation defined by $T(x_1, x_2) = (x_1 - x_2, x_2 - x_1, -x_1)$. The nullty T is : (2) 1 (1) 2(4) None of these (3) 0**84.** Let $F: \mathbb{R}^3 \to \mathbb{R}^2$ be defined by F(x, y, z) = (1x, y + z), then : (1) *F* is linear transformation (2) F is not a linear transformation (3) *F* is invertible (4) None of these 85. Let V(F) be the vector space of all polynomial in x in which an inner product is defined by $(f,g) = \int_{0}^{\infty} f(x)g(x)dx$. Then for f(x) = x + 2, $g(x) = x^{2} - 2x - 3$, $\langle f, g \rangle$ is equal to : (2) $\frac{5}{8}$ (3) $\frac{37}{4}$ (4) $-\frac{37}{4}$ $(1) \frac{5}{2}$ The linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ defined by T(1, 0) = (2, 3), T(0, 1) = (5, 6) is : (1) one one and onto , (2) one one but not onto (3) onto but not one one (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

86.



- **87.** Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ be defined by T(x, y, z) = (x, y, 0) and $S: \mathbb{R}^2 \to \mathbb{R}^2$ be defined by S(x, y) = (2x, 3y), are linear transformation on the real vector spaces R^3 and R^2 respectively. Then which of the following is correct ?
 - (1) T and S are both singular
 - (2) T and S are both non-singular
 - (3) T is singular but S is non-singular
 - (4) None of these

A

The integral $\int_{0}^{1} x^{m-1} (1-x)^{n-1} dx$ is known as : 88.

- (1) Theta function (2) Zeta function
- (3) Gamma function (4) Beta function

Fourier expansion of f(x) = |x| in $[-\pi, \pi]$ is : 89.

- (1) $-\frac{4}{\pi}\left(\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots\right)$
- (2) $\frac{\pi}{2} \frac{4}{\pi} \left(\frac{\cos x}{1} + \frac{\cos 3x}{3} + \frac{\cos 5x}{5} + \dots \right)$
- (3) $\frac{\pi}{2} \frac{4}{\pi} \left(\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots \right)$
- (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)



If the function f(z) is continuous at z_0 , then : 90.

- (1) f(z) is differentiable at z_0
- (2) f(z) is not necessarily differentiable at z_0
- (3) f(z) is analytic at z_0

(4) None of these

91. Polar form of C. R. equations are :

- (1) $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}, \frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}$
- (2) $\frac{\partial u}{\partial \theta} = \frac{1}{r} \frac{\partial v}{\partial r}, \frac{\partial u}{\partial r} = r \frac{\partial v}{\partial \theta}$
- (3) $\frac{\partial u}{\partial \theta} = r \frac{\partial v}{\partial r}, \frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}$
- (4) None of these
- The fixed points of the mapping $W = \frac{5z+4}{z+5}$ are : 92.
 - (2) 2, -2(1) 2,2
 - (3) -2, -2(4) None of these
- The inverse point of the point *z* with respect to the circle |z| = r is : 93.
 - (2) $\frac{r^2}{2}$ (1) $\frac{r}{\bar{z}}$ (3) $\frac{r^2}{\bar{z}}$ (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)

A

Fourier series for the function f(x) in the interval $(c, c + 2\pi)$ is : 94.

(1)
$$f(x) = \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$$

(2) $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \sin nx + \sum_{n=1}^{\infty} b_n \cos nx$

(3)
$$f(x) = \sum_{n=1}^{\infty} a_n \sin nx + \sum_{n=1}^{\infty} b_n \cos nx$$

(4)
$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin x$$

The value of $\Delta^n(a^x)$ is : 95.

- (1) $(a^{nh}+1)a^x$ (2) $(a^{nh}-1)a^x$
- (3) $(a^h + 1)^n_{a^x}$ (4) $(a^h - 1)^n_{a^x}$

The order of convergence of Newton-Raphson method is : 96.

(1) 1 (2) 1.618

(3) 2(4) None of these

Runge-Kutta method is used for : 97.

(1) Interpolation

(2) Numerical differentiation

(3) Numerical Integration

(4) Numerical solution of ordinary differential equation

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)



A

20

98

x	0	1	2	3
f(x)	1	2	1.	10
(1) $2x^3 - 7x^2 + 6$	x + 1	(2) $x^3 -$	$7x^2 - 6x + 1$	
(3) $2x^3 + 7x^2 - 6x^3$	c+2	(4) None	e of these	
In decomposition	method, if $u_{ii} =$	1, then the meth	hod is called :	
(1) Doolittle meth	nod	(2) Crou	it's method	
(3) Euler's metho	d	(4) None	e of these	
The quadrature f	ormulae $\int_{-1}^{1} f(x) dx$	$x = \frac{1}{3} [f(-1) + 4f($	(0) + f(1) with step	length $h = 1.0$ is
exact for polynom	ual of degree les	s than or equal t	:o:	
(1) Two	(2) Three	(3) Four	(4) Not	ne of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(A)



opened at 2:20pm a Used for uploadin	on 27-6-2023 performenter on university wessite Total	No. of Printer	d Pages: 21
(DO NOT OPEN THIS Q	UESTION BOOKLET BEFOR	E TIME OR U	INTIL YOU
R	ARE ASKED TO DO SO)		SET-X
	PG-EE-June, 2023		
SUBJE	ECT : Mathematics G	roup	10454
		Sr. No	
Time : 1¼ Hours	Max. Marks : 100	Total	Questions : 100
Roll No. (in figures)	(in words)		
Name	Date of Birth		

Father's Name

Mother's Name_

Date of Examination_

(Signature of the Candidate)

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are compulsory.

- 2. The candidates *must return* the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
- 4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
- The candidate *must not* do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers *must not* be ticked in the question booklet.
- 6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

- The number of non-isomorphic abelian groups of order 8 is :
 - (1) 1
 (2) 2
 (3) 3
 (4) none of these
- **2.** The number of prime ideals of Z_{10} is :
 - (1) 2 (2) 1 (3) 0 (4) none of (4)
- **3.** The ring of Z, Q, R, C, Z₅ are :
- (2) 1(4) none of these

1.9 perpendicular all the anticipation of the

and near months 5

(1) Daraha hali hali hali hali hali

(1) All integral domains

(2) None of them is integral domain

- (3) Some of them is integral domain
- (4) None of these
- 4. Which statement is wrong?

F is a field, then F[x] is :

- (1) Euclidean domain
- (2) Principal ideal domain
- (3) Unique factorization domain
- (4) None of these
- 5. In S. H. M. the maximum velocity is :

(1)
$$V_{\rm max} = a$$
 (2) $V_{\rm max} = \sqrt{\mu} a$

(3) $V_{max} = \mu a$

(4) None of these

A (I) A (I) A (I) A (I)

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

P. T. O.

AND A AND A

9. Central Minister d struct as :

2

6. The uniform force that will move on kg. mass from rest through one metre in one second is :

(1) 4 Newton

(2) 3 Newton

(4) None of these

at the same in a second the second

120million on Core

A. Livite, representation and

1. O. MIL DEND & P

(I) I sidhaan aominin t

anob minimum final autominity (

(3) 2 Newton

7. At an apse, the radius vector is :

(1) perpendicular to the tangent

(2) parallel to the tangent

- (3) perpendicular to the apsidal distance
- (4) None of these
- 8. The radial and transverse acceleration of a particle moving along a plane curve manned Actional and an anal to sended (2)

(1)
$$r \frac{dr}{dt}, \frac{d\theta}{dt}$$

(2) $\frac{dr}{dt}, r \frac{d\theta}{dt}$
(3) $\frac{d^2r}{dt^2} - r \left(\frac{d\theta}{dt}\right)^2, \frac{1}{r} \frac{d}{dt} \left[r^2 \frac{d\theta}{dt}\right]$
(4) None of these

- 9. Central force is defined as :
 - (1) A force whose line of action always passes through variable point.
 - (2) A force whose line of action always passes through a fixed point.
 - (3) A force whose line of action does not pass through a fixed point.
 - (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)



B

10. Frequency of a simple harmonic motion is :



11. Generating function for Bessel function $J_n(x)$ is :

2)
$$e^{\frac{x}{2}\left(\frac{1}{t}-t\right)}$$

(3)
$$e^{x(t-\frac{1}{t})}$$

1

(1) $e^{\frac{x}{2}(t-\frac{1}{t})}$

(4) None of these

a general mental solution and the state of the

17. White will be the manning size of a deminity with

The company out on the Longer no west west

OBUS

IST TO MORE ON OT 181.

Locinus 9 Stable

1. 1. 1. S. 1. S. 1.

P. T. O.

81

12. Rodrigue formula for Legendre polynomials is :

(1)
$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 - 1)^n$$

(2)
$$P_n(x) = \frac{1}{2^n} \frac{d^n}{dx^n} (x^2 - 1)^n$$

(3)
$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 + 1)^n$$

(4) None of these

13. The Laplace transform of $te^{-t} \sin 3t$ is equal to :

1)
$$\frac{36}{(s^2+2s+10)^2}$$
 (2) $\frac{6(s+1)}{(s^2+2s+10)^2}$

(3)
$$\frac{s+1}{(s^2+2s+6)^2}$$

(4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)



14. The generating function of Legendre's polynomials is :

(1) $(1+2xt+t^2)^{3/2}$ (2) $(1+2x+t^2)^{1/2}$

(3) $(1 = 2xt + t^2)^{-1/2}$ (4) None of these

15. The sine Fourier transform of $2e^{-5x}$ is :

(1)
$$\frac{5s}{s^2+4}$$
 (2) $\frac{-5s}{s^2+4}$

 $(3) \quad \frac{58}{8^2 + 25}$

4

(4) None of these

- 16. Which of the following keyword is used for the storage class ?(1) print f(2) external
 - (3) auto (4) none of these
- 17. What will be the maximum size of a double variable ?
 - (1) 16 bytes (2) 8 bytes
 - (3) 4 bytes (4) none of these
- **18.** The continue command cannot be used with :
 - (1) switch (2) for (3) do
- (4) none of these

8

1 .01

- **19.** The bitwise OR operator is used to :
 - (1) divide number
 - (2) set the desired bits to 0
 - (3) set the desired bits to 1
 - (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

A second s

Scanned with CamScanner

Scal	lineu	VVILII	Camocanner

20. C is which kind of language ?

(1) machine

(3) objected-oriented

(4) none of these

(2) assembly

21. If $\lim_{x \to 0} \frac{ae^x - b\cos x + ce^{-x}}{x\sin x} = 2$, then value of *b* is equal to : (4) 2 (3) 0 (2) -1 (1) -2 **22.** If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then value of $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$ is equal to :

3

12

rs

5

and an and the state of the second of the states



The equation of normal to the surface xyz = 4 at the point (1, 2, 2) is equal to : 23.

(1)
$$\frac{X-1}{2} = \frac{Y-2}{1} = \frac{Z-2}{1}$$
 (2) $\frac{X-1}{1} = \frac{Y-2}{2} = \frac{Z-2}{1}$

(3) $\frac{X-1}{3} = \frac{Y-2}{2} = \frac{Z-2}{2}$ (4) None of these

The necessary and sufficient condition for the curve to be a plane curve is : 24.

111 0	
r'' = 0	
1	r]=0

(1)
$$[\overrightarrow{r}, \overrightarrow{r'}, \overrightarrow{r''}] = 0$$
 (2) $[\overrightarrow{r'}, \overrightarrow{r''}, \overrightarrow{r''}] = 0$

The roll characturi-lins of the partia

(4) none of these (3) $[\overrightarrow{r''}\overrightarrow{r'''}\overrightarrow{r}] = 0$

25. The maximum value of the function $\sin x + \sin y + \sin (\sin x + y)$ is :

(1)
$$\frac{3\sqrt{3}}{2}$$
 (2) $\sqrt{3}$ (3) $\frac{\sqrt{3}}{2}$ (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

26. A partial differential equation by eliminating the arbitrary functions from : z = f(x-ay) + g(x + ay) is given by :

(1)
$$\frac{\partial^2 z}{\partial x^2} = \frac{\partial^2 z}{\partial y^2}$$

(2) $\frac{\partial^2 z}{\partial y^2} = a^2 \frac{\partial^2 z}{\partial x^2}$
(3) $\frac{\partial^2 z}{\partial x^2} = a^2 \frac{\partial^2 z}{\partial y^2}$
(4) none of these

27. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3 \frac{\partial^3 z}{\partial x^2 \partial y} + 4 \frac{\partial^3 z}{\partial y^3} = e^{x \cdot 2y}$ is:

(1) $\frac{1}{8}e^{x+2y}$ (3) $\frac{1}{27}e^{x+2y}$

6

(2) $\frac{1}{2}e^{2y}$

(4) none of these

28. The partial differential equation $\frac{\partial^2 z}{\partial x^2} - 7 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = 0$ is :

(1) Hyperbolic

(2) Parabolic

(3) Elliptic

(4) None of these

29. The real characteristics of the partial differential equation $\frac{\partial^2 z}{\partial x^2} + 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = 0$ is :

(1) 4x = y + c (2) 3x + y = 0 (3) 8x - y = 0 (4) y - 2x = c

30. To two dimensional heat equation is given by :

(1)
$$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = \frac{1}{c} \frac{\partial u}{\partial t}$$

(2) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 8$
(3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial y} = \frac{1}{c^2} \frac{\partial^2 u}{\partial x^2}$
(4) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2} \frac{\partial u}{\partial t}$

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

- **31.** The remainder in the divison of 2²⁰ by 7 is :
 - (1) 0 (2) 1 (3) 2
- 32. Every natural number greater than one has at least :
 - (1) one prime factor (2) two prime factor
 - (3) two composite factors (4) none of these
- 33. Find the highest power of 7 contained in 1000!
- (1) 264 (2) 164 (3) 64 (4) none of these **34.** If $|\cos(\alpha - i\beta)| = 1$, then $\sin^2 \alpha$ is equal to : (1) $\cos h^2 \beta$ (2) $\sin h^2 \beta$
 - (3) $\tan h^2\beta$ (4) none of these
- **35.** If *p* is a prime number then $(p 1)! + 1 \equiv 0 \pmod{p}$ is the statement of :
 - (1) Chinese remainder theorem
 - (2) Fermat's theorem
 - (3) Wilson's theorem
 - (4) Reduced residue theorem
- **36.** If A is a non-singular matrix of order *n*, then adj (adj A) is equal to :

(1)
$$|A|^{n+1} A$$

(2) $|A|^n A$
(3) $|A|^{n-1} A$
(4) $|A|^{n-2} A$

37. The vectors $\begin{bmatrix} 2 & 3 & 5 \\ 0 & -1 & -1 \\ k & 5 & 1 \end{bmatrix}$ are linearly dependent, then value of *k* is equal to :

(1) -4 (3) 0 (4) 4

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)



P. T. O.

(4) 4

12-4 MG - 66

Second In Mille

- 38. The characteristics roots of a Hermitian matrix are :
 - (1) Imaginary (2) Real
 - (3) Complex number
- (4) None of these
- 39. Determinant of an idempotent matrix equals :

(1) 1 (2) 0 (4) none of these (3) 1 or 0 40. The equations $x^4 + 3x^3 - 5x^2 - 6x - 8 = 0$ common roots the of and $x^4 + x^3 - 9x^2 + 10x - 8 = 0$ are:

(1) 2,3 (2) 3, 4 (3) 4,0

41. Polar form of C. R. equations are :

(1)
$$\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}, \frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}$$

(2) $\frac{\partial u}{\partial \theta} = \frac{1}{r} \frac{\partial v}{\partial r}, \frac{\partial u}{\partial r} = r \frac{\partial v}{\partial \theta}$
(3) $\frac{\partial u}{\partial \theta} = r \frac{\partial v}{\partial r}, \frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}$

(4) None of these

42. The fixed points of the mapping $W = \frac{5z+4}{z}$ are : z+5(1) 2,2 (2) 2, -2

(3) -2, -2(4) None of these

43. The inverse point of the point *z* with respect to the circle |z| = r is :

(1)
$$\frac{r}{\overline{z}}$$
 (2) $\frac{r^2}{z}$ (3) $\frac{r^2}{\overline{z}}$ (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

Contract of the second second second

(2) Format's Lacorem

ATTACKART CONCERNENT (E)

(I) Ci mèse remaindendindendremenn

(4) Reduced resident from Content

44. Fourier series for the function f(x) in the interval $(c, c + 2\pi)$ is :

(1)
$$f(x) = \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$$

(2)
$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \sin nx + \sum_{n=1}^{\infty} b_n \cos nx$$

(3)
$$f(x) = \sum_{n=1}^{\infty} a_n \sin nx + \sum_{n=1}^{\infty} b_n \cos nx$$

(4)
$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin x$$

自命

11. L'arditile method

GM IWO

AT (3) Eulersmeihend.

45. The value of $\Delta^n(a^x)$ is :

The guided tature formulae 31./(v)dx of //(v) (1) $(a^{nh} + 1)a^x$ (2) $(a^{nh} - 1)a^x$ exact, for polymonal of degree less than or Equal to (3) $(a^h + 1)^n_{a^x}$ (4) $(a^h - 1)^n_{a^x}$ and in

46. The order of convergence of Newton-Raphson method is : mul bolaniod at 11 the fail an ung is and b? · (2) · 1.618 . (1) 1 (2) f(F,P) = -tf(F,P)(9) (1) a (9) (1) (1) None of these (4) (3) 2 13711 - 18 181 A. 18 164 $-1 \quad \text{Liff} \quad = 0 \quad . \quad \text{Liff} \quad .$

Runge-Kutta method is used for : 47.

(1) Interpolation

- (2) Numerical differentiation
- (3) Numerical Integration

(4) Numerical solution of ordinary differential equation

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

52. Which office in and and

ALCER STATES AND AND A

10

48. The values of a function *f*(*x*) are tabulated below :

x	0	1	2	3
f(x)	1	2	S & SDATENPS	10

1)
$$2x^3 - 7x^2 + 6x + 1$$
 (2) $x^3 - 7x^2 - 6x + 1$

(3) $2x^3 + 7x^2 - 6x + 2$ (4) None of these

49. In decomposition method, if $u_{ii} = 1$, then the method is called :

(1) Doolittle method

Euler's method

(3)

(2) Crout's method

45. She value of Ada) is

(4) None of these

The quadrature formulae $\int f(x)dx = \frac{1}{3}[f(-1) + 4f(0) + f(1)]$ with step length h = 1.0 is 50. exact for polynomial of degree less than or equal to :

- Two (1) (2) Three (4) None of these (3) Four
- If f is bounded function defined on [a, b] and P be a partition of f[a, b], then which of 51. the following is odd?

(1) $L(f, P) \le U(f, P)$ (2) L(-f, P) = -U(f, P)

(3) U(P, -f) = -L(P, f)

(4) U(-f, P) = -U(f, P)

52. Which of the following is *not* a bounded metric?

(1)
$$d(x, y) = |x - y|$$
 (2) $d(x, y) = \min\{2, |x - y|\}$

discrete metric (3)

(4) $d^*(x,y) = \frac{d(x,y)}{1+d(x,y)}$

where *d* is any metric on *X*.

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

ROIN-2022 ~~

В

53. Which one is a dense set ?

(1) the subset
$$A = \left\{\frac{1}{n}, n \in N\right\}$$
 in R

(2) set of natural number in R

(3) Q in R

(4) none of these

54. If $f(x) = \frac{1}{x^2}$ on [1, 4] and P = [1, 2, 3, 4] be the partition of [1, 4], then L(f, P) is equal

11

32

to:

(1)
$$\frac{70}{144}$$
 (2) $\frac{61}{144}$
(3) $\frac{30}{144}$ (4) none of these

55. The integral $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$ is:

(1) convergent

(2) divergent

(3) conditionally convergent

(4) none of these

and in antity! (A)

0 13 /3 3 1

- 56. A sphere (open or closed) is always :
 - (1) empty (2) non-empty
 - (3) singleton set (4) none of these
- 57. What is odd against the given statement "A set is closed iff" ?

(1) $A = \overline{A}$ (2) $d(A) \subset A$

(3) A^C is open (4) A = Å

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)



- The order of *a* and *x* in a group are respectively 3 and 4. Then the order of $x^{-1}ax$ is : 58.
 - (4) 3 (2) 8 (3) 5 (1) 12
- Every group is isomorphic to a permutation group. This result is known as : 59.
 - (2) Cauchy theorem (1) Lagrange theorem
 - (3) Cayley's theorem (4) Gauss theorem
- The number of conjugacy classes in a group of order 25 is : 60.

States (

(1) none (

55. The michail

(I) CHACE TO (I)

(in a monality route (f)

56. A woldered open inteleved) is a were st

- (1) 1 (2) 5 (3) 25 (4) none of these
- **61.** Co-efficient of the vector (5, -1, 2) w. r. t. basis (1, 4, 2), (4, 2, 1), (2, 1, 3) are :
 - (1) (1, 1, 1)(2) (-1, 1, 1)
 - (4) None of these (3) (1, 2, 3)
- **62.** Which is an orthogonal set?
 - $(1) \{(1, 0, 1), (1, 0, -1), (0, 1, 0)\}$
 - $(2) \ \{(1,0,1),(1,0,-1),(0,3,4)\}$
 - $(3) \{(1,0,1), (1,0,-1), (-1,0,1)\}$

(4) None of these

63. Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be linear transformation defined by $T(x_1, x_2) = (x_1 - x_2, x_2 - x_1, -x_1)$. and the state of the second state of the second The nullty *T* is :

(2) 1 (1) 2 (4) None of these (3) 0

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

The state of the second st

4192.

64. Let $F: \mathbb{R}^3 \to \mathbb{R}^2$ be defined by F(x, y, z) = (1x, y + z), then :

- (1) F is linear transformation
- (2) F is not a linear transformation
- (3) F is invertible
- (4) None of these

65. Let V(F) be the vector space of all polynomial in x in which an inner product

is defined by $(f,g) = \int f(x)g(x)dx$. Then for f(x) = x + 2, $g(x) = x^2 - 2x - 3$, $\langle f, g \rangle$ is

equal to :

(3) $\frac{37}{4}$ (4) $-\frac{37}{4}$ (1) $\frac{5}{2}$ (2) $\frac{5}{8}$

66. The linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ defined by T(1, 0) = (2, 3), T(0, 1) = (5, 6) is :

(2) one one but not onto (1) one one and onto 44) None of mese

(4) none of these (3) onto but not one one

67. Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ be defined by T(x, y, z) = (x, y, 0) and $S: \mathbb{R}^2 \to \mathbb{R}^2$ be defined by S(x, y) = (2x, 3y), are linear transformation on the real vector spaces R^3 and R^2 respectively. Then which of the following is correct ?

(1) T and S are both singular

- (2) T and S are both non-singular
 - (3) T is singular but S is non-singular
 - (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)



15 DH / 15 26 -1 (2) -1

- general La statesti (FL

71. There is a long back part of the

P.T.O.

gu ingth (i)

13

68. The integral $\int x^{m-1}(1-x)^{n-1}dx$ is known as :

14

Theta function (1)

(2) Zeta function

Willing to Stand Stand Stand Stand Stand

Veril Mer

L'un son the first find

V ragil an welles is a married bit of the

And Strict Strict States

в

.00

Gamma function (3) (4) Beta function

69. Fourier expansion of f(x) = |x| in $[-\pi, \pi]$ is :

(1) $-\frac{4}{\cos x} \cos 3x \cos 5x$

(1)
$$\pi \left(\frac{1^2}{1^2} + \frac{3^2}{3^2} + \frac{5^2}{5^2} + \dots \right)$$

(2) $\frac{\pi}{2} - \frac{4}{\pi} \left(\frac{\cos x}{1} + \frac{\cos 3x}{3} + \frac{\cos 5x}{5} + \dots \right)$

(3)
$$\frac{\pi}{2} - \frac{4}{\pi} \left(\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots \right)$$

(1) was one and were (2) and the basis one and and (1) (4) None of these

70. If the function f(z) is continuous at z_0 , then :

(1) f(z) is differentiable at z_0 an and market definitions and agent'

(2) f(z) is not necessarily differentiable at z_0

(3) f(z) is analytic at z_0

- (4) None of these
- **71.** The resolved part of a force *f* in a direction perpendicular to it is :
 - Maximum (1)

Minimum (2)

F (- W T) Y CJ beat is it.

(3) F

(4) 0

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner
- 72. Centre of gravity of a thin uniform triangular lamina divides every median in the ratio :
 - (1) 1:2 (2) 2:1 (3) 2:3 (4) 1:4
- **73.** The force of friction called into play when there is equilibrium is called :
 - (1) Limiting friction (2) Dynamical friction
 - (3) Statical friction (4) None of these
- 74. Which type of forces from the couple ?

- (1) Two equal and unlike parallel forces with same lines of action.
- (2) Two equal and unlike parallel forces with different lines of action.
- (3) Two unequal and like parallel forces with different lines of action.
- (4) Two unequal and unlike parallel forces with different lines of action.
- 75. The gravitational unit of moment in S.I. system is :
 - (1) Dyne-centimeter

(2) Newton meter

(3) gm. cm

(4) kg. m

76. Every non-empty subset of R which is bounded above must have l.u.b. This result is

STRING

known as :

(1) Law of well ordering

(2) Law of trichotomy

(3) Completeness axiom

(4) Archimedian property of real numbers

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

P. T. O.

16

...

77. The g.l.b. of a set :

(1) belongs to the set

(2) does not belong to the set The information called and a dub share to for a long to could brance is equilibring is edu.

(3) may or may not belong to the set

(4) none of these

78. If $\sum a_n$ is convergent and the sequence $\langle b_n \rangle$ is monotonic and bounded, then n=1Which is used forces from the unuple is

œ

 $\sum a_n b_n$ is convergent. This statement is known as : 10 carries for the fill we know the leader of the brief for the fill of the n=1

- Abel's test (2) Abel's lemma (1)
- (3) Dirichlet's test (4) None of these

79. The series $\sum_{n=1}^{\infty} a_n$, where $a_n = \sqrt{n^4 + 1} - \sqrt{n^4 - 1}$ is : while birs teepston ow I (4) n=1The gravital ignition as an antiput in S.L. system is

- (1) convergent (2) divergent
- (3) oscillating

(4) none of these

80. The infinite product $\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{3^2}\right)\left(1-\frac{1}{4^2}\right)$ is:

(2) e^2

- (1) divergent
- (3) oscillating

(1) $\frac{e}{a}$

The value of $\lim_{x\to 0} (1+2x)^{\frac{x+5}{2}}$ is : 81.

(2) convergent

(4) none of these

(3) e^{5}

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

(4) e^{10}

ATTAC A STATE AND AND AND A STATE

в

in States

mathing and mill (i)

DELLA DELLA CLEED

1:5 (2)

В

- 82. Area bounded by the parabola 2y = x² and the line x = y − 4 is equal to :
 (1) 6 (2) 18 (3) ∞ (4) none of these
- **83.** The radius of curvature at the origin of the curve $x^2 + 6y^2 + 2x y = 0$ is: (1) $\frac{1}{5\sqrt{2}}$ (2) $\frac{1}{3\sqrt{5}}$ (3) $\frac{1}{2\sqrt{5}}$ (4) $\frac{1}{\sqrt{5}}$
- **84.** The nature of double points on the curve $(y x)^2 + x^7 = 0$:
 - (1) a cusp (2) a node
 - (3) conjugate point (4) none of these
- **85.** The asymptotes of the curve $r \cos \theta = a \cos 2\theta$:

(1) $r\cos\theta + a = 0$ (2) $r\sin\theta + a = 0$

- (3) $r \tan \theta + a = 0$ (4) none of these
- **86.** What is the nature of the curve $13x^2 18xy + 37y^2 + 2x + 14y 2 = 0$?
 - (1) circle (2) sphere
 - (3) hyperbola (4) ellipse
- **87.** The equation of the plane which cuts the paraboloid $x^2 2y^2 = z$ in a conic with its centre at the point $\left(2, \frac{3}{2}, 4\right)$ is given by :

(1) 3x + 4y + z = 0(2) 2x + 4y - z + 7 = 0(3) 4x - 6y - z + 5 = 0(4) None of these

88. The latus rectum of the parabola $(a^2 + b^2)(x^2 + y^2) = (bx + ay - ab)^2$ is :

(1)
$$\frac{2ab}{\sqrt{a^2 + b^2}}$$
 (2) $ab \cdot \sqrt{a^2 + b^2}$
(3) $\sqrt{a^2 + b^2}$ (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

P. T. O.

17

2030 (001111

A TECHNIC II

10 1010 10

DIMINIST (

...

The equation of circle with radius 'a' and touching the initial line at pole is : 89.

(2) $r = 2a \sin \theta$ (1) $r = a \tan \theta$

90. The points in which the line, $\frac{x+1}{-1} = \frac{y-12}{5} = \frac{z-7}{2}$ cuts the surface $11x^2 - 5y^2 + z^2 = 0$ are :

(2) (1, 2, 3), (2, -3, 1) (1) (3, 2, 1), (2, 0, 1)

(4) none of these

- (4) None of these (3) (2, 1, 1), (1, 0, -1) A BYTHING OF THE MER OF THE FULLY C. F.
- **91.** The general solution of ordinary differential equation of 'n' order contains : - 0 200 X 7 0
 - (1) *n*-arbitrary constants
 - (2) more than n-arbitrary constants
 - (3) any number of arbitrary constant
 - (4) none of these

(3) $r = 2a \cot \theta$

92. General solution of
$$\frac{dy}{dx} + 2xy = 2e^{-x^2}$$
 is :

(1)
$$y = (2x+c)e^{-x^2}$$
 (2) $y = 2xe^{-x^2}$

- (4) none of these (3) $y = e^{-x}$

(i= n + W (+ 1' x (*)

36. IVLATE BURG DURING OF DATA STATES

The necessary condition for the equation M(x, y)dx + N(x, y)dy = 0, to be exact is : 93.

(1)
$$\frac{\partial N}{\partial y} = \frac{\partial M}{\partial x}$$

(2) $\frac{\partial N}{\partial y} = -\frac{\partial M}{\partial x}$
(3) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$
(4) $\frac{\partial M}{\partial y} = -\frac{\partial N}{\partial x}$

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

- **94.** The equation ydx + xdy = 0 is :
 - (1) Partial differential equation
 - (2) Exact differential equation
 - (3) Non-exact differential equation
 - (4) None of these
- **95.** For the differential equation $x\frac{dy}{dx} y = 0$, which of the following function is not an integrating factor ?

(1) $\frac{1}{x^2}$ (2) $\frac{1}{y^2}$ (3) $\frac{1}{xy}$ (4) $\frac{1}{x+y}$

96. If \vec{a} and \vec{b} are two vectors such that $\vec{a} \times \vec{b} = 0$ and $\vec{a} \cdot \vec{b} = 0$, then :

- (1) \vec{a} is parallel to \vec{b}
- (2) \vec{a} is at right angle to \vec{b}
- (3) either \vec{a} or \vec{b} is a null vector
- (4) none of these
- **97.** The unit normal vector to the surface $x^4 3xyz + z^2 + 1 = 0$ at the point (1, 1, 1) is :

1)
$$\frac{i+3j+k}{\sqrt{\pi}}$$
 (2) $\frac{i-3j-k}{\sqrt{\pi}}$

(3)
$$\frac{i+3j-k}{\sqrt{\pi}}$$

(4) None of these

98. A vector \vec{f} is called an irrotational vector if :

(1) div curl $\vec{f} = 0$ (2) $\nabla \cdot \vec{f} = 0$

(3) $\nabla \times \vec{f} = 0$

(4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

P.T.O.

19

11 - LO BERGE TERMINE

0 1 (main with (E)

100. Which distance gis wollars did with 601 W. 1001

20

۰.

Which of the following is not true? 99.

> (2) div (grad ϕ) = 0 (1) curl (grad ϕ) = 0 (4) $\operatorname{curl}(\vec{r}) = 0$ (3) div (curl \vec{f}) = 0

Which of the following is related with Stoke's theorem ? 100.

(1) A line integral and a volume integral

(2) A surface integral and a volume integral

(3) A line integral, a surface integral and a volume integral

34. The article will ... AR

Long Contract

the Une of ference al coupt

(i) and the state of the state

B) silibut mean haile a dubi vector

The first of a shall be will at many is shall be built.

iend alaris. In principal of (S)

si skarling pror (e).

notosi anti molo

- (4) A line integral and a surface integral see. We have bring the contractive biotophility of the brind is the work

PG-EE-June, 2023/(Mathematics)(SET-X)/(B)

Scanned with CamScanner

opened at 2:20 pm on 27.6.2023 used for uploading on university website future of Total No. of Printed	barry Nehathogen d Pages : 21
(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR U ARE ASKED TO DO SO) PG-EE-June, 2023	SET-X
SUBJECT : Mathematics Group	10415

Time : 1¼ Hours	Max. Marks : 100	Total Questions : 100		
Roll No. (in figures)	(in words)	1		
Name	Date of Birth			
Father's Name	Mother's Name			
Date of Examination	· · · · · · · · · · · · · · · · · · ·			

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are compulsory.

(Signature of the Candidate)

- 2. The candidates *must return* the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
- 4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
- 5. The candidate *must not* do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers *must not* be ticked in the question booklet.
- 6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

1. The resolved part of a force *f* in a direction perpendicular to it is :

- (1) Maximum (2) Minimum
- (3) F (4) 0
- 2. Centre of gravity of a thin uniform triangular lamina divides every median in the ratio :
 - (1) 1:2 (2) 2:1 (3) 2:3 (4) 1:4
- 3. The force of friction called into play when there is equilibrium is called :
 - (1) Limiting friction

С

- (2) Dynamical friction
- (3) Statical friction
- (4) None of these

4. Which type of forces from the couple?

- (1) Two equal and unlike parallel forces with same lines of action.
- (2) Two equal and unlike parallel forces with different lines of action.
- (3) Two unequal and like parallel forces with different lines of action.
- (4) Two unequal and unlike parallel forces with different lines of action.

5. The gravitational unit of moment in S.I. system is :

- (1) Dyne-centimeter (2) Newton meter
- (3) gm. cm

(4) kg. m

PG-EE-June, 2023/(Mathematics)(SET-X)/(C)

P. T. O.

- Every non-empty subset of R which is bounded above must have l.u.b. This result is known as :
 - (1) Law of well ordering
 - (2) Law of trichotomy
 - (3) Completeness axiom
 - (4) Archimedian property of real numbers
- 7. The g.l.b. of a set :
 - (1) belongs to the set
 - (2) does not belong to the set
 - (3) may or may not belong to the set
 - (4) none of these
- 8. If $\sum_{n=1}^{\infty} a_n$ is convergent and the sequence $\langle b_n \rangle$ is monotonic and bounded, then

 $\sum_{n=1}^{\infty} a_n b_n$ is convergent. This statement is known as :

(1) Abel's test

(2) Abel's lemma

(3) Dirichlet's test

- (4) None of these
- **9.** The series $\sum_{n=1}^{\infty} a_n$, where $a_n = \sqrt{n^4 + 1} \sqrt{n^4 1}$ is :
 - (1) convergent (2) divergent
 - (3) oscillating (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(C)

The infinite product $\left(1 - \frac{1}{2^2}\right) \left(1 - \frac{1}{3^2}\right) \left(1 - \frac{1}{4^2}\right)$ is : 10. (1) divergent (2) convergent (3) oscillating (4) none of these **11.** The value of $\lim_{x \to 0} (1+2x)^{\frac{x+5}{2}}$ is : (1) $\frac{e}{2}$ (2) e^2 (4) e^{10} (3) e^5 Area bounded by the parabola $2y = x^2$ and the line x = y - 4 is equal to : 12. (1) 6 (2) 18 (3) ∞ (4) none of these The radius of curvature at the origin of the curve $x^2 + 6y^2 + 2x - y = 0$ is : 13. (1) $\frac{1}{5\sqrt{2}}$ (2) $\frac{1}{3\sqrt{5}}$ (3) $\frac{1}{2\sqrt{5}}$ (4) $\frac{1}{\sqrt{5}}$ The nature of double points on the curve $(y - x)^2 + x^7 = 0$: 14. (1) a cusp (2) a node (3) conjugate point (4) none of these The asymptotes of the curve $r \cos \theta = a \cos 2\theta$: 15. (1) $r\cos\theta + a = 0$ (2) $r\sin\theta + a = 0$ (3) $r \tan \theta + a = 0$ (4) none of these What is the nature of the curve $13x^2 - 18xy + 37y^2 + 2x + 14y - 2 = 0$? **16**. (2) sphere (1) circle (3) hyperbola (4) ellipse PG-EE-June, 2023/(Mathematics)(SET-X)/(C) P. T. O.

С

The equation of the plane which cuts the paraboloid $x^2 - 2y^2 = z$ in a conic with its 17. centre at the point $\left(2,\frac{3}{2},4\right)$ is given by : (1) 3x + 4y + z = 0(2) 2x + 4y - z + 7 = 0(3) 4x - 6y - z + 5 = 0(4) None of these 18. The latus rectum of the parabola $(a^2 + b^2)(x^2 + y^2) = (bx + ay - ab)^2$ is : (1) $\frac{2ab}{\sqrt{a^2+b^2}}$ (2) $ab \cdot \sqrt{a^2 + b^2}$ (3) $\sqrt{a^2 + b^2}$ (4) none of these The equation of circle with radius 'a' and touching the initial line at pole is : 19. (1) $r = a \tan \theta$ (2) $r = 2a \sin \theta$ (3) $r = 2a \cot \theta$ (4) none of these The points in which the line, $\frac{x+1}{-1} = \frac{y-12}{5} = \frac{z-7}{2}$ cuts the surface $11x^2 - 5y^2 + z^2 = 0$ [.] 20. are : (1) (3, 2, 1), (2, 0, 1)(2) (1, 2, 3), (2, -3, 1)(3) (2, 1, 1), (1, 0, -1)(4) None of these The general solution of ordinary differential equation of 'n' order contains : 21. (1) *n*-arbitrary constants

С

- (2) more than n-arbitrary constants
- (3) any number of arbitrary constant
- (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(C)

22. General solution of $\frac{dy}{dx} + 2xy = 2e^{-x^2}$ is: (1) $y = (2x+c)e^{-x^2}$ (2) $y = 2xe^{-x}$ (3) $y = e^{-x}$ (4) none of these

- **23.** The necessary condition for the equation M(x, y)dx + N(x, y)dy = 0, to be exact is :
 - (1) $\frac{\partial N}{\partial y} = \frac{\partial M}{\partial x}$ (2) $\frac{\partial N}{\partial y} = -\frac{\partial M}{\partial x}$ (3) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ (4) $\frac{\partial M}{\partial y} = -\frac{\partial N}{\partial x}$
- **24.** The equation ydx + xdy = 0 is :

С

- (1) Partial differential equation
- (2) Exact differential equation
- (3) Non-exact differential equation
- (4) None of these
- **25.** For the differential equation $x\frac{dy}{dx} y = 0$, which of the following function is not an integrating factor ?
 - (1) $\frac{1}{x^2}$ (2) $\frac{1}{y^2}$ (3) $\frac{1}{xy}$ (4) $\frac{1}{x+y}$
- **26.** If \vec{a} and \vec{b} are two vectors such that $\vec{a} \times \vec{b} = 0$ and $\vec{a} \cdot \vec{b} = 0$, then :
 - (1) \vec{a} is parallel to \vec{b}
 - (2) \vec{a} is at right angle to \vec{b}
 - (3) either \vec{a} or \vec{b} is a null vector
 - (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(C)

P. T. O.

6

- (1) $\frac{i+3j+k}{\sqrt{\pi}}$ (2) $\frac{i-3j-k}{\sqrt{\pi}}$
- (3) $\frac{i+3j-k}{\sqrt{\pi}}$ (4) None of these

28. A vector \vec{f} is called an irrotational vector if :

- (1) div curl $\vec{f} = 0$ (2) $\nabla \cdot \vec{f} = 0$ (3) $\nabla \times \vec{f} = 0$ (4) none of these
- **29.** Which of the following is *not* true ?
 - (1) curl (grad ϕ) = 0 (2) div (grad ϕ) = 0
 - (3) div (curl \overrightarrow{f}) = 0 (4) curl (\overrightarrow{r}) = 0

30. Which of the following is related with Stoke's theorem ?

- (1) A line integral and a volume integral
- (2) A surface integral and a volume integral

(3) A line integral, a surface integral and a volume integral

(4) A line integral and a surface integral

31. Polar form of C. R. equations are :

(1) $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}, \quad \frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}$ (2) $\frac{\partial u}{\partial \theta} = \frac{1}{r} \frac{\partial v}{\partial r}, \quad \frac{\partial u}{\partial r} = r \frac{\partial v}{\partial \theta}$ (3) $\frac{\partial u}{\partial \theta} = r \frac{\partial v}{\partial r}, \quad \frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}$ (4) None of these

The fixed points of the mapping $W = \frac{5z+4}{z+5}$ are : 32.

C

(1) 2, 2 (2) 2, -2 (3) -2, -2(4) None of these

The inverse point of the point *z* with respect to the circle |z| = r is : 33.

- (1) $\frac{r}{\bar{z}}$ (2) $\frac{r^2}{r}$ (3) $\frac{r^2}{\bar{z}}$ (4) None of these
- Fourier series for the function f(x) in the interval $(c, c + 2\pi)$ is : 34.
 - (1) $f(x) = \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$
 - (2) $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \sin nx + \sum_{n=1}^{\infty} b_n \cos nx$

(3)
$$f(x) = \sum_{n=1}^{\infty} a_n \sin nx + \sum_{n=1}^{\infty} b_n \cos nx$$

(4)
$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin x$$

The value of $\Delta^n(a^x)$ is : 35.

- (2) $(a^{nh}-1)a^x$ (1) $(a^{nh}+1)a^x$
- (3) $(a^h + 1)^n_{a^x}$ (

4)
$$(a^{h}-1)^{n}_{a^{x}}$$

36. The order of convergence of Newton-Raphson method is :

- (1) 1 (2) 1.618
- (3) 2

39.

40.

(4) None of these

C

- 37. Runge-Kutta method is used for :
 - (1) Interpolation
 - (2) Numerical differentiation
 - (3) Numerical Integration
 - (4) Numerical solution of ordinary differential equation
- **38.** The values of a function f(x) are tabulated below :

	and the second se						
<i>x</i>	0	1	2	3			
f(x)	1	2	1	10			
(1) $2x^3 - 7x^2 + 6x + 1$ (2) $x^3 - 7x^2 - 6x + 1$							
(3) $2x^3 + 7x^2 - 6x + 2$ (4) None of these							
In decomposition method, if $u_{ii} = 1$, then the method is called :							
(1) Doolittle method (2) Crout's method							
(3) Euler's method (4) None of these							
The quadrature formulae $\int_{-1}^{1} f(x)dx = \frac{1}{3}[f(-1) + 4f(0) + f(1)]$ with step length $h = 1.0$ is exact for polynomial of degree less than or equal to :							
(1) Two (2) Three (3) Four (4) None of these							

- **41.** If *f* is bounded function defined on [*a*, *b*] and *P* be a partition of *f*[*a*, *b*], then which of the following is odd ?
 - (1) $L(f, P) \le U(f, P)$ (2) L(-f, P) = -U(f, P)(3) U(P, -f) = -L(P, f)(4) U(-f, P) = -U(f, P)
- **42.** Which of the following is *not* a bounded metric ?
 - (1) d(x, y) = |x y| (2) $d(x, y) = \min\{2, |x y|\}$
 - (3) discrete metric

(4) $d^*(x,y) = \frac{d(x,y)}{1+d(x,y)}$

where d is any metric on X.

- **43.** Which one is a dense set ?
 - (1) the subset $A = \left\{\frac{1}{n}, n \in N\right\}$ in R
 - (2) set of natural number in R
 - (3) Q in R
 - (4) none of these

44. If $f(x) = \frac{1}{x^2}$ on [1, 4] and P = [1, 2, 3, 4] be the partition of [1, 4], then L(f, P) is equal to :

(1) $\frac{70}{144}$ (2) $\frac{61}{144}$ (3) $\frac{30}{144}$ (4) none of these

45. The integral $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$ is :

(1) convergent

- (2) divergent
- (3) conditionally convergent
- (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(C)

9

P. T. O.

.

10

46. A sphere (open or closed) is always : (1) empty (2) non-empty (3) singleton set (4) none of these **47.** What is odd against the given statement "A set is closed iff" ? (1) $A = \overline{A}$ (2) $d(A) \subset A$ (3) A^C is open (4) A = ÅThe order of a and x in a group are respectively 3 and 4. Then the order of $x^{-1}ax$ is : 48. (1) 12 (2) 8 (3) 5 (4) 3 Every group is isomorphic to a permutation group. This result is known as : 49. (1) Lagrange theorem (2) Cauchy theorem (3) Cayley's theorem (4) Gauss theorem The number of conjugacy classes in a group of order 25 is : 50. (1) 1 (2) 5 (3) 25 (4) none of these If $\lim_{x \to 0} \frac{ae^x - b\cos x + ce^{-x}}{x\sin x} = 2$, then value of *b* is equal to : 51. (1) -2 (2) -1 (3) 0 (4) 2 **52.** If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then value of $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$ is equal to : (1) $\frac{1}{x^2 + y^2 + z^2}$ (2) $\frac{1}{x^3 + y^3 + z^3}$ (3) $\frac{3}{x+y+7}$ (4) None of these

(1) $\frac{X-1}{2} = \frac{Y-2}{1} = \frac{Z-2}{1}$ (2) $\frac{X-1}{1} = \frac{Y-2}{2} = \frac{Z-2}{1}$ (3) $\frac{X-1}{3} = \frac{Y-2}{2} = \frac{Z-2}{2}$ (4) None of these

С

54. The necessary and sufficient condition for the curve to be a plane curve is :

- (1) $[\overrightarrow{r}, \overrightarrow{r'}, \overrightarrow{r''}] = 0$ (2) $[\overrightarrow{r'}, \overrightarrow{r''}, \overrightarrow{r''}] = 0$ (3) $[\overrightarrow{r'}, \overrightarrow{r''}, \overrightarrow{r''}] = 0$ (4) none of these
- **55.** The maximum value of the function $\sin x + \sin y + \sin (\sin x + y)$ is :
 - (1) $\frac{3\sqrt{3}}{2}$ (2) $\sqrt{3}$ (3) $\frac{\sqrt{3}}{2}$ (4) None of these
- **56.** A partial differential equation by eliminating the arbitrary functions from : z = f(x-ay) + g(x + ay) is given by :
 - (1) $\frac{\partial^2 z}{\partial x^2} = \frac{\partial^2 z}{\partial y^2}$ (2) $\frac{\partial^2 z}{\partial y^2} = a^2 \frac{\partial^2 z}{\partial x^2}$ (3) $\frac{\partial^2 z}{\partial x^2} = a^2 \frac{\partial^2 z}{\partial x^2}$ (4) none of these
- **57.** The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ is :
 - (1) $\frac{1}{8}e^{x+2y}$ (2) $\frac{1}{2}e^{2y}$ (3) $\frac{1}{27}e^{x+2y}$ (4) none of these
- **58.** The partial differential equation $\frac{\partial^2 z}{\partial x^2} 7 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = 0$ is :
 - (1) Hyperbolic (2) Parabolic
 - (3) Elliptic (4
 - (4) None of these

59. The real characteristics of the partial differential equation $\frac{\partial^2 z}{\partial x^2} + 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = 0$ is:

- (1) 4x = y + c(2) 3x + y = 0(3) 8x - y = 0(4) y - 2x = c
- 60. To two dimensional heat equation is given by :
 - (1) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = \frac{1}{c} \frac{\partial u}{\partial t}$ (2) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 8$ (3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial y} = \frac{1}{c^2} \frac{\partial^2 u}{\partial x^2}$ (4) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2} \frac{\partial u}{\partial t}$

61. The number of non-isomorphic abelian groups of order 8 is :

- (1) 1 (2) 2
- (3) 3 (4) none of these
- **62.** The number of prime ideals of Z_{10} is :
 - (1) 2 (2) 1
 - (3) 0 (4) none of these
- **63.** The ring of Z, Q, R, C, Z_5 are :
 - (1) All integral domains
 - (2) None of them is integral domain
 - (3) Some of them is integral domain
 - (4) None of these

- **64.** Which statement is *wrong*?
 - *F* is a field, then F[x] is :
 - (1) Euclidean domain
 - (2) Principal ideal domain
 - (3) Unique factorization domain
 - (4) None of these
- **65.** In S. H. M. the maximum velocity is :
 - (1) $V_{\max} = a$ (2) $V_{\max} = \sqrt{\mu} a$
 - (3) $V_{max} = \mu a$

(4) None of these

- **66.** The uniform force that will move on kg. mass from rest through one metre in one second is :
 - (1) 4 Newton

(2) 3 Newton

(3) 2 Newton

(4) None of these

- 67. At an apse, the radius vector is :
 - (1) perpendicular to the tangent
 - (2) parallel to the tangent
 - (3) perpendicular to the apsidal distance
 - (4) None of these

- **68.** The radial and transverse acceleration of a particle moving along a plane curve $r = f(\theta)$ are :
 - (1) $r\frac{dr}{dt}, \frac{d\theta}{dt}$

(2)
$$\frac{dr}{dt}, r\frac{d\theta}{dt}$$

(3)
$$\frac{d^2r}{dt^2} - r\left(\frac{d\theta}{dt}\right)^2, \frac{1}{r}\frac{d}{dt}\left[r^2\frac{d\theta}{dt}\right]$$

(4) None of these

69. Central force is defined as :

(1) A force whose line of action always passes through variable point.

(2) A force whose line of action always passes through a fixed point.

(3) A force whose line of action does not pass through a fixed point.

- (4) None of these
- **70.** Frequency of a simple harmonic motion is :
 - (1) $\frac{\mu}{\pi}$ (2) $\frac{\pi}{\mu}$ (3) $\frac{\sqrt{\mu}}{\pi}$ (4) $\frac{\sqrt{\mu}}{2\pi}$

71. Co-efficient of the vector (5, -1, 2) w. r. t. basis (1, 4, 2), (4, 2, 1), (2, 1, 3) are :

- (1) (1, 1, 1) (2) (-1, 1, 1)
- (3) (1, 2, 3) (4) None of these

72. Which is an orthogonal set ?

С

- (1) $\{(1, 0, 1), (1, 0, -1), (0, 1, 0)\}$
- $(2) \ \{(1,0,1), (1,0,-1), (0,3,4)\}\$
- $(3) \ \{(1,0,1), (1,0,-1), (-1,0,1)\}\$
- (4) None of these
- **73.** Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be linear transformation defined by $T(x_1, x_2) = (x_1 x_2, x_2 x_1, -x_1)$. The nullty *T* is :
 - (1) 2 (2) 1
 - (3) 0 (4) None of these
- **74.** Let $F: \mathbb{R}^3 \to \mathbb{R}^2$ be defined by F(x, y, z) = (1x, y + z), then :
 - (1) F is linear transformation
 - (2) F is not a linear transformation
 - (3) *F* is invertible
 - (4) None of these

75. Let V(F) be the vector space of all polynomial in x in which an inner product is defined by $(f,g) = \int_{0}^{1} f(x)g(x)dx$. Then for f(x) = x + 2, $g(x) = x^{2} - 2x - 3$, $\langle f, g \rangle$ is equal to :

(1) $\frac{5}{2}$ (2) $\frac{5}{8}$ (3) $\frac{37}{4}$ (4) $-\frac{37}{4}$

76. The linear transformation $T : \mathbb{R}^2 \to \mathbb{R}^2$ defined by T(1, 0) = (2, 3), T(0, 1) = (5, 6) is :

- (1) one one and onto (2) one one but not onto
- (3) onto but not one one (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(C)

P. T. O.

77. Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ be defined by T(x, y, z) = (x, y, 0) and $S: \mathbb{R}^2 \to \mathbb{R}^2$ be defined by S(x, y) = (2x, 3y), are linear transformation on the real vector spaces \mathbb{R}^3 and \mathbb{R}^2 respectively. Then which of the following is *correct*?

C

- (1) T and S are both singular
- (2) T and S are both non-singular
- (3) T is singular but S is non-singular
- (4) None of these
- **78.** The integral $\int_{0}^{1} x^{m-1} (1-x)^{n-1} dx$ is known as :
 - (1) Theta function (2) Zeta function
 - (3) Gamma function (4) Beta function
- **79.** Fourier expansion of f(x) = |x| in $[-\pi, \pi]$ is :
 - (1) $-\frac{4}{\pi}\left(\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots\right)$
 - (2) $\frac{\pi}{2} \frac{4}{\pi} \left(\frac{\cos x}{1} + \frac{\cos 3x}{3} + \frac{\cos 5x}{5} + \dots \right)$

(3)
$$\frac{\pi}{2} - \frac{4}{\pi} \left(\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots \right)$$

(4) None of these

80.	If the function $f(z)$ is continuous at z_0 , then :						
	(1) $f(z)$ is differentiable at z_0						
	(2) $f(z)$ is not necessarily differentiable at z_0						
	(3) $f(z)$ is analytic at z_0						
	(4) None of these						
81.	The remainder in the divison of 2^{20} by 7 is :						
	(1) 0 (2) 1 (3) 2 (4) 4						
82.	Every natural number greater than one has at least :						
	(1) one prime factor (2) two prime factor						
	(3) two composite factors (4) none of these						
83.	Find the highest power of 7 contained in 1000!						
	(1) 264 (2) 164 (3) 64 (4) none of these						
84.	If $ \cos(\alpha - i\beta) = 1$, then $\sin^2 \alpha$ is equal to :						
	(1) $\cos h^2 \beta$ (2) $\sin h^2 \beta$						
	(3) $\tan h^2\beta$ (4) none of these						
85.	If <i>p</i> is a prime number then $(p - 1)! + 1 \equiv 0 \pmod{p}$ is the statement of :						
	(1) Chinese remainder theorem (2) Fermat's theorem						
	(3) Wilson's theorem (4) Reduced residue theorem						
86.	If A is a non-singular matrix of order <i>n</i> , then adj (adj A) is equal to :						
	(1) $ A ^{n+1} A$ (2) $ A ^n A$						
	(3) $ A ^{n-1} A$ (4) $ A ^{n-2} A$						
*							

PG-EE-June, 2023/(Mathematics)(SET-X)/(C)

17

P. T. O.

C **87.** The vectors $\begin{vmatrix} 2 & 3 & 5 \\ 0 & -1 & -1 \\ k & 5 & 1 \end{vmatrix}$ are linearly dependent, then value of k is equal to : (1) -4 (2) -2 (3) 0 (4) 4 The characteristics roots of a Hermitian matrix are : 88. (1) Imaginary (2) Real (3) Complex number (4) None of these Determinant of an idempotent matrix equals : 89. (1) 1 (2) 0 (3) 1 or 0 (4) none of these The common roots of the equations $x^4 + 3x^3 - 5x^2 - 6x - 8 = 0$ $x^4 + x^3 - 9x^2 + 10x - 8 = 0$ are: 90. and (2) 3, 4 (1) 2, 3 (3) 4,0 (4) -4, 291. Generating function for Bessel function $J_n(x)$ is : (1) $e^{\frac{x}{2}(t-\frac{1}{t})}$ (3) $e^{x(t-\frac{1}{t})}$ (2) $e^{\frac{x}{2}\left(\frac{1}{t}-t\right)}$ (4) None of these Rodrigue formula for Legendre polynomials is : 92. (1) $P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 - 1)^n$ (2) $P_n(x) = \frac{1}{2^n} \frac{d^n}{dx^n} (x^2 - 1)^n$ (3) $P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 + 1)^n$ (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(C)

93. The Laplace transform of $te^{-t} \sin 3t$ is equal to :

(1)
$$\frac{36}{(s^2 + 2s + 10)^2}$$

(2) $\frac{6(s+1)}{(s^2 + 2s + 10)^2}$
(3) $\frac{s+1}{(s^2 + 2s + 6)^2}$
(4) None of these

94. The generating function of Legendre's polynomials is :

- (1) $(1+2xt+t^2)^{3/2}$ (2) $(1+2x+t^2)^{1/2}$ (3) $(1-2xt+t^2)^{-1/2}$ (4) None of these
- **95.** The sine Fourier transform of $2e^{-5x}$ is :
 - (1) $\frac{5s}{s^2 + 4}$ (2) $\frac{-5s}{s^2 + 4}$ (3) $\frac{5s}{s^2 + 25}$ (4) None of these

96. Which of the following keyword is used for the storage class ?

- (1) print f.(2) external(3) auto(4) none of these
- 97. What will be the maximum size of a double variable ?
 - (1) 16 bytes (2) 8 bytes
 - (3) 4 bytes (4) none of these
- **98.** The continue command cannot be used with :
 - (1) switch (2) for (3) do

PG-EE-June, 2023/(Mathematics)(SET-X)/(C)

P. T. O.

(4) none of these

99. The bitwise OR operator is used to :

- (1) divide number
- (2) set the desired bits to 0
- (3) set the desired bits to 1
- (4) none of these
- **100.** C is which kind of language ?
 - (1) machine

- (2) assembly
- (3) objected-oriented
- (4) none of these

С

brned at 2:20, used for	pm on 27.6-2023 uploading on university	Loebsite Automa fauite Total No. of Printed Pages : 21
(DO NOT OPEN T	THIS QUESTION BOOKLET E ARE ASKED TO DO PG-EE-June, 2 SUBJECT : Mathemat	BEFORE TIME OR UNTIL YOUso)SET-X2023SET-Xtics Group10428
		Sr. No
Time : 1¼ Hours Roll No. (in figures)	Max. Marks : 100 (in words)	Total Questions : 100
Name	Date of Birth_	
Father's Name	Mother's Name	e
Date of Examination		
(Signature of the Car	didate)	(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are compulsory.

- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfairmeans / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
- 4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
- 5. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- 6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.



The remainder in the divison of 2^{20} by 7 is : 1. (1) 0(2) 1 (3) 2(4) 4 Every natural number greater than one has at least : 2. (1) one prime factor (2) two prime factor (3) two composite factors (4) none of these Find the highest power of 7 contained in 1000! 3. (1) 264 (2) 164 (4) none of these (3) 64 If $|\cos(\alpha - i\beta)| = 1$, then $\sin^2 \alpha$ is equal to : 4. (2) $\sin h^2 \beta$ (1) $\cos h^2 \beta$ (3) $\tan h^2\beta$ (4) none of these If *p* is a prime number then $(p - 1)! + 1 \equiv 0 \pmod{p}$ is the statement of : 5. (1) Chinese remainder theorem (2) Fermat's theorem (3) Wilson's theorem (4) Reduced residue theorem If A is a non-singular matrix of order n, then adj (adj A) is equal to : 6. (1) $|A|^{n+1} A$ (2) $|A|^n A$ (4) $|A|^{n-2} A$ (3) $|A|^{n-1} A$ **7.** The vectors $\begin{bmatrix} 2 & 3 & 5 \\ 0 & -1 & -1 \\ k & 5 & 1 \end{bmatrix}$ are linearly dependent, then value of *k* is equal to : (4) 4 (2) -2(1) -4(3) 0P. T. O. PG-EE-June, 2023/(Mathematics)(SET-X)/(D)

D

The characteristics

- **8.** The characteristics roots of a Hermitian matrix are :
 - (1) Imaginary (2) Real
 - (3) Complex number (4) None of these
- 9. Determinant of an idempotent matrix equals :
 - (1) 1 (2) 0 (3) 1 or 0 (4) none of these
- **10.** The common roots of the equations $x^4 + 3x^3 5x^2 6x 8 = 0$ and $x^4 + x^3 9x^2 + 10x 8 = 0$ are:
 - (1) 2, 3 (2) 3, 4 (3) 4, 0 (4) -4, 2
- 11. Polar form of C. R. equations are :
 - (1) $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}, \frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}$ (2) $\frac{\partial u}{\partial \theta} = \frac{1}{r} \frac{\partial v}{\partial r}, \frac{\partial u}{\partial r} = r \frac{\partial v}{\partial \theta}$
 - (3) $\frac{\partial u}{\partial \theta} = r \frac{\partial v}{\partial r}, \frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}$
 - (4) None of these

12. The fixed points of the mapping $W = \frac{5z+4}{z+5}$ are :

- (1) 2, 2 (2) 2, -2
- (3) -2, -2 (4) None of these
- **13.** The inverse point of the point *z* with respect to the circle |z| = r is :
 - (1) $\frac{r}{\overline{z}}$ (2) $\frac{r^2}{z}$ (3) $\frac{r^2}{\overline{z}}$ (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)





D

14. Fourier series for the function f(x) in the interval $(c, c + 2\pi)$ is :

(1)
$$f(x) = \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$$

(2) $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \sin nx + \sum_{n=1}^{\infty} b_n \cos nx$
(3) $f(x) = \sum_{n=1}^{\infty} a_n \sin nx + \sum_{n=1}^{\infty} b_n \cos nx$
(4) $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin x$

- **15.** The value of $\Delta^n(a^x)$ is :
 - (2) $(a^{nh}-1)a^x$ (1) $(a^{nh} + 1)a^x$
 - (4) $(a^h 1)^n_{a^x}$ (3) $(a^h + 1)^n_{a^{\chi}}$
- The order of convergence of Newton-Raphson method is : 16.
 - (2) 1.618 (1) 1
 - (4) None of these (3) 2
- 17. Runge-Kutta method is used for :
 - (1) Interpolation
 - (2) Numerical differentiation
 - (3) Numerical Integration
 - (4) Numerical solution of ordinary differential equation

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)

P. T. O.



D

18.	The values of a fu	unction $f(x)$ are table	liated below .		3		
	x	0	1	1	10		
	f(x)	1	2	1	10		
	(1) $2x^3 - 7x^2 + 6$	<i>x</i> + 1	(2) $x^3 - 7x^2 - 6x + 1$				
	(3) $2x^3 + 7x^2 - 6$	x + 2	(4) None of	these			
19.	In decomposition method, if $u_{ii} = 1$, then the method is called :						
	(1) Doolittle met	hod	(2) Crout's	method	2 (199 HE)		
	(3) Euler's metho	od	(4) None of	these			
20.	20. The quadrature formulae $\int_{0}^{1} f(x) dx = \frac{1}{2} [f(-1) + 4f(0) + f(1)]$ with step length $h = 1$						
exact for polynomial of degree less than or equal to :							
	(1) Two	(2) Three	(3) Four	(4) No	one of these		
	(1) Iwo (2) Inree (3) Four (4) None of mess21. The number of non-isomorphic abelian groups of order 8 is :						
21.							
	(1) 1	(2) 2	(3) 3	(4) nor	ne of these		
22.	2. The number of prime ideals of Z_{10} is :						
	(1) 2	(2) 1	(3) 0	(4) no:	ne of these		
23.	The ring of Z , Q , R , C , Z_5 are :						
	(1) All integral domains						
(2) None of them is integral domain							
	(3) Some of then	n is integral domai	n				
	(4) None of thes	e					
PG-EI	E-June, 2023/(Math	ematics)(SET-X)/(D)				

Which statement is *wrong*? 24.

D

F is a field, then F[x] is :

- (1) Euclidean domain
- (2) Principal ideal domain
- (3) Unique factorization domain
- (4) None of these
- In S. H. M. the maximum velocity is : 25.
 - (2) $V_{\rm max} = \sqrt{\mu} a$ (1) $V_{max} = a$
 - (3) $V_{\max} = \mu a$
- The uniform force that will move on kg. mass from rest through one metre in one 26. second is :
 - (2) 3 Newton
 - (3) 2 Newton
- 27. At an apse, the radius vector is :
 - (1) perpendicular to the tangent
 - (2) parallel to the tangent
 - (3) perpendicular to the apsidal distance
 - (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)



P. T. O.

5

Scanned with OKEN Scanner

- (4) None of these

(4) None of these

- (1) 4 Newton

- The radial and transverse acceleration of a particle moving along a plane curve 28. $r = f(\theta)$ are :
 - (1) $r\frac{dr}{dt}, \frac{d\theta}{dt}$
 - (2) $\frac{dr}{dt}, r\frac{d\theta}{dt}$
 - (3) $\frac{d^2r}{dt^2} r\left(\frac{d\theta}{dt}\right)^2, \frac{1}{r}\frac{d}{dt}\left[r^2\frac{d\theta}{dt}\right]$
 - (4) None of these

29. Central force is defined as :

(1) A force whose line of action always passes through variable point.

(2) A force whose line of action always passes through a fixed point.

(3) A force whose line of action does not pass through a fixed point.

(4) None of these

Frequency of a simple harmonic motion is : 30.

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

$$(3) \quad \frac{\sqrt{\mu}}{\pi} \qquad \qquad (4) \quad \frac{\sqrt{\mu}}{2\pi}$$

31. Generating function for Bessel function $J_n(x)$ is :

- (2) $e^{\frac{x}{2}\left(\frac{1}{t}-t\right)}$ (1) $e^{\frac{x}{2}\left(t-\frac{1}{t}\right)}$
- $(3) e^{x\left(t-\frac{1}{t}\right)}$ (4) None of these



32. Rodrigue formula for Legendre polynomials is :

(1)
$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 - 1)^n$$

(2)
$$P_n(x) = \frac{1}{2^n} \frac{d^n}{dx^n} (x^2 - 1)^n$$

(3)
$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 + 1)^n$$

- (4) None of these
- The Laplace transform of $te^{-t} \sin 3t$ is equal to : 33.

(1)
$$\frac{36}{(s^2 + 2s + 10)^2}$$

(2) $\frac{6(s+1)}{(s^2 + 2s + 10)^2}$
(3) $\frac{s+1}{(s^2 + 2s + 6)^2}$
(4) None of these

- The generating function of Legendre's polynomials is : 34.
 - (2) $(1+2x+t^2)^{1/2}$ (1) $(1+2xt+t^2)^{3/2}$
 - (3) $(1-2xt+t^2)^{-1/2}$ (4) None of these
- **35.** The sine Fourier transform of $2e^{-5x}$ is :

1)
$$\frac{5s}{s^2+4}$$
 (2) $\frac{-5s}{s^2+4}$

- (3) $\frac{5s}{s^2+25}$
- (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)

P. T. O.



D

8		
36	. Which of the following keyword is use	d for the storage class ?
	(1) print f	(2) external
	(3) auto	(4) none of these
37	What will be the maximum size of a do	ouble variable ?
	(1) 16 bytes	(2) 8 bytes
	(3) 4 bytes	(4) none of these
38.	The continue command cannot be used	l with :
	(1) switch (2) for	(3) do (4) none of these
39.	The bitwise OR operator is used to :	
	(1) divide number	
	(2) set the desired bits to 0	
	(3) set the desired bits to 1	
	(4) none of these	
40.	C is which kind of language ?	
	(1) machine	(2) assembly
	(3) objected-oriented	(4) none of these
41.	If $\lim_{x \to 0} \frac{ae^x - b\cos x + ce^{-x}}{x\sin x} = 2$, then value	e of b is equal to :
	(1) -2 (2) -1	(3) 0 (4) 2
PG-E	E-June, 2023/(Mathematics)(SET-X)/(D)	


D

42. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then value of $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$ is equal to :

(2) $\frac{1}{x^3 + y^3 + z^3}$ (1) $\frac{1}{r^2 + v^2 + z^2}$ (3) $\frac{3}{x+y+z}$ (4) None of these

The equation of normal to the surface xyz = 4 at the point (1, 2, 2) is equal to : 43.

(1) $\frac{X-1}{2} = \frac{Y-2}{1} = \frac{Z-2}{1}$ (2) $\frac{X-1}{1} = \frac{Y-2}{2} = \frac{Z-2}{1}$ (3) $\frac{X-1}{3} = \frac{Y-2}{2} = \frac{Z-2}{2}$ (4) None of these

The necessary and sufficient condition for the curve to be a plane curve is : 44.

(2) $\begin{bmatrix} \overrightarrow{r} & \overrightarrow{r} & \overrightarrow{r} \end{bmatrix} = 0$ (1) $\begin{bmatrix} \overrightarrow{r} & \overrightarrow{r'} & \overrightarrow{r''} \end{bmatrix} = 0$ (3) $\begin{bmatrix} \overrightarrow{r} & \overrightarrow{r} & \overrightarrow{r} \\ \overrightarrow{r} & \overrightarrow{r} & \overrightarrow{r} \end{bmatrix} = 0$ (4) none of these

The maximum value of the function $\sin x + \sin y + \sin (\sin x + y)$ is : 45.

- (3) $\frac{\sqrt{3}}{2}$ (1) $\frac{3\sqrt{3}}{2}$ (2) $\sqrt{3}$ (4) None of these
- A partial differential equation by eliminating the arbitrary functions from : 46. z = f(x-ay) + g(x + ay) is given by :

(1)
$$\frac{\partial^2 z}{\partial x^2} = \frac{\partial^2 z}{\partial y^2}$$
 (2) $\frac{\partial^2 z}{\partial y^2} = a^2$

(3) $\frac{\partial^2 z}{\partial r^2} = a^2 \frac{\partial^2 z}{\partial u^2}$

(4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)



 $\frac{\partial^2 z}{\partial x^2}$

CONCLETIBLE STREEM MALESUS and P. T. O.

47. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3 \frac{\partial^3 z}{\partial x^2 \partial y} + 4 \frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ is :

(1) $\frac{1}{2}e^{x+2y}$ (2) $\frac{1}{2}e^{2y}$ (3) $\frac{1}{27}e^{x+2y}$ (4) none of these

48. The partial differential equation $\frac{\partial^2 z}{\partial x^2} - 7 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = 0$ is :

(1) Hyperbolic

(2) Parabolic

(3) Elliptic

(4) None of these

The real characteristics of the partial differential equation $\frac{\partial^2 z}{\partial x^2} + 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = 0$ is : 49. (1) 4x = y + c (2) 3x + y = 0(3) 8x - y = 0 (4) y - 2x = c

- 50. To two dimensional heat equation is given by :
 - (1) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = \frac{1}{c} \frac{\partial u}{\partial t}$ (2) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 8$
 - (3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial y} = \frac{1}{c^2} \frac{\partial^2 u}{\partial x^2}$ (4) $\frac{\partial^2 u}{\partial r^2} + \frac{\partial^2 u}{\partial u^2} = \frac{1}{c^2} \frac{\partial u}{\partial t}$
- **51.** The value of $\lim_{x \to 0} (1+2x)^{\frac{x+5}{2}}$ is :
 - (2) e^2 (3) e^5 (4) e^{10} (1) $\frac{e}{2}$

52. Area bounded by the parabola $2y = x^2$ and the line x = y - 4 is equal to : (2) 18 (1) 6 (3) ∞ (4) none of these

The radius of curvature at the origin of the curve $x^2 + 6y^2 + 2x - y = 0$ is : 53.

(1)
$$\frac{1}{5\sqrt{2}}$$
 (2) $\frac{1}{3\sqrt{5}}$ (3) $\frac{1}{2\sqrt{5}}$ (4) $\frac{1}{\sqrt{5}}$

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)

D

The nature of double points on the curve $(y - x)^2 + x^7 = 0$: 54. (1) a cusp (2) a node (3) conjugate point (4) none of these The asymptotes of the curve $r \cos \theta = a \cos 2\theta$: 55. (1) $r\cos\theta + a = 0$ (2) $r \sin \theta + a = 0$ (3) $r \tan \theta + a = 0$ (4) none of these What is the nature of the curve $13x^2 - 18xy + 37y^2 + 2x + 14y - 2 = 0$? 56. (1) circle (2) sphere (3) hyperbola (4) ellipse The equation of the plane which cuts the paraboloid $x^2 - 2y^2 = z$ in a conic with its 57. centre at the point $\left(2,\frac{3}{2},4\right)$ is given by : (2) 2x + 4y - z + 7 = 0(1) 3x + 4y + z = 0(3) 4x - 6y - z + 5 = 0(4) None of these The latus rectum of the parabola $(a^2 + b^2)(x^2 + y^2) = (bx + ay - ab)^2$ is : 58. (1) $\frac{2ab}{\sqrt{a^2+b^2}}$ (2) $ab \cdot \sqrt{a^2 + b^2}$ (3) $\sqrt{a^2 + b^2}$ (4) none of these The equation of circle with radius 'a' and touching the initial line at pole is : 59. (1) $r = a \tan \theta$ (2) $r = 2a \sin \theta$ (3) $r = 2a \cot \theta$ (4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)

D

P. T. O.

11

12		$2 = 5x^2 + 7^2 =$	0					
60.	The points in which the line, $\frac{x+1}{-1} = \frac{y}{-1}$	$\frac{-12}{5} = \frac{z-7}{2}$ cuts the surface $11x^2 - 5y^2 + 2$						
	are :							
	(L) and the second s	(2) $(1 \ 2 \ 3)$ $(2, -3, 1)$						
	(1) (3, 2, 1), (2, 0, 1)	(2) (1, 2, 3), (2, 3, 7)						
	(3) (2, 1, 1), (1, 0, -1)	(4) None of these						
61.	The resolved part of a force f in a direction perpendicular to it is :							
	(1) Maximum	(2) Minimum						
	(3) F	(4) 0						
62	Centre of gravity of a thin uniform triangular lamina divides every median in							
02.	ratio :	57						
	(1) $1 \cdot 2$ (2) $2 : 1$	(3) 2:3 (4) 1:4						
		here there is equilibrium is called :						
63.	The force of friction called into play when there is equilibrian is called a							
	(1) Limiting friction							
	(2) Dynamical friction	•						
	(3) Statical friction							
	(b) Statical Interior							
	(4) None of these							
64.	• Which type of forces from the couple ?							
	(1) Two equal and unlike parallel forces with same lines of action.							
	(2) Two equal and unlike parallel forces with different lines of action.							
	(3) Two unequal and like parallel forces with different lines of action.							
	(4) Two unequal and unlike parallel forces with different lines of action.							
PG-EE	-June, 2023/(Mathematics)(SET-X)/(D)		34					



65. The gravitational unit of moment in S.I. system is :

- (1) Dyne-centimeter (2) Newton meter
- (3) gm. cm (4) kg. m

66. Every non-empty subset of R which is bounded above must have l.u.b. This result is known as :

- (1) Law of well ordering
- (2) Law of trichotomy
- (3) Completeness axiom
- (4) Archimedian property of real numbers
- The g.l.b. of a set : 67.

D

- (1) belongs to the set
- (2) does not belong to the set
- (3) may or may not belong to the set
- (4) none of these

68. If $\sum_{n=1}^{\infty} a_n$ is convergent and the sequence $\langle b_n \rangle$ is monotonic and bounded, then $\sum_{n=1}^{\infty} a_n b_n$ is convergent. This statement is known as :

(1) Abel's test

(2) Abel's lemma

(3) Dirichlet's test

(4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)



69. The series
$$\sum_{n=1}^{\infty} a_n$$
, where $a_n = \sqrt{n^4 + 1} - \sqrt{n^4 - 1}$ is :
(1) convergent (2) divergent
(3) oscillating (4) none of these
70. The infinite product $\left(1 - \frac{1}{2^2}\right) \left(1 - \frac{1}{3^2}\right) \left(1 - \frac{1}{4^2}\right)$ is :
(1) divergent (2) convergent
(3) oscillating (4) none of these
71. If *f* is bounded function defined on [*a*, *b*] and *P* be a partition of *f*[*a*, *b*], then which of
the following is odd ?
(1) $L(f, P) \leq U(f, P)$ (2) $L(-f, P) = -U(f, P)$
(3) $U(P, -f) = -L(P, f)$ (4) $U(-f, P) = -U(f, P)$
(3) $U(P, -f) = -L(P, f)$ (4) $U(-f, P) = -U(f, P)$
72. Which of the following is *not* a bounded metric ?
(1) $d(x, y) = |x - y|$ (2) $d(x, y) = \min\{2, |x - y|\}$
(3) discrete metric (4) $d^*(x, y) = \frac{d(x, y)}{1 + d(x, y)}$
where *d* is any metric on *X*.
73. Which one is a dense set ?
(1) the subset $A = \left\{\frac{1}{n}, n \in N\right\}$ in *R*
(2) set of natural number in *R*

(3) Q in R

(4) none of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)



D

74. If $f(x) = \frac{1}{x^2}$ on [1, 4] and P = [1, 2, 3, 4] be the partition of [1, 4], then L(f, P) is equal to: (1) $\frac{70}{144}$ (2) $\frac{61}{144}$ (3) $\frac{30}{144}$ (4) none of these

75. The integral $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$ is :

(1) convergent

(2) divergent

(4) none of these

- (3) conditionally convergent (4) none of these
- A sphere (open or closed) is always : 76.
 - (1) empty (2) non-empty
 - (3) singleton set

What is odd against the given statement "A set is closed iff" ? 77.

(1) $A = \overline{A}$ (2) $d(A) \subset A$ (3) A^C is open (4) $A = \mathring{A}$

The order of *a* and *x* in a group are respectively 3 and 4. Then the order of $x^{-1}ax$ is : 78.

(2) 8 (3) 5 (1) 12 (4) 3 79. Every group is isomorphic to a permutation group. This result is known as : (2) Cauchy theorem (1) Lagrange theorem (3) Cayley's theorem (4) Gauss theorem PG-EE-June, 2023/(Mathematics)(SET-X)/(D)



80. The number of conjugacy classes in a group of order 25 is :

(4) none of these (1) 1 (2) 5 (3) 25

81. The general solution of ordinary differential equation of 'n' order contains :

- (1) *n*-arbitrary constants
- (2) more than n-arbitrary constants
- (3) any number of arbitrary constant
- (4) none of these
- **82.** General solution of $\frac{dy}{dx} + 2xy = 2e^{-x^2}$ is :
 - (1) $y = (2x+c)e^{-x^2}$ (2) $y = 2xe^{-x}$
 - (3) $y = e^{-x}$ (4) none of these

The necessary condition for the equation M(x, y)dx + N(x, y)dy = 0, to be exact is : 83.

(2) $\frac{\partial N}{\partial y} = -\frac{\partial M}{\partial x}$ (1) $\frac{\partial N}{\partial y} = \frac{\partial M}{\partial x}$

3)
$$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$$
 (4) $\frac{\partial M}{\partial y} = -\frac{\partial N}{\partial x}$

- **84.** The equation ydx + xdy = 0 is :
 - (1) Partial differential equation
 - (2) Exact differential equation
 - (3) Non-exact differential equation
 - (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)



D

For the differential equation $x \frac{dy}{dx} - y = 0$, which of the following function is not an -85. integrating factor ?

(2) $\frac{1}{y^2}$ (1) $\frac{1}{r^2}$ (3) $\frac{1}{xy}$ (4) $\frac{1}{x+y}$

86. If \vec{a} and \vec{b} are two vectors such that $\vec{a} \times \vec{b} = 0$ and $\vec{a} \cdot \vec{b} = 0$, then :

(1) \overrightarrow{a} is parallel to \overrightarrow{b}

D

- (2) \vec{a} is at right angle to \vec{b}
- (3) either \overrightarrow{a} or \overrightarrow{b} is a null vector
- (4) none of these

The unit normal vector to the surface $x^4 - 3xyz + z^2 + 1 = 0$ at the point (1, 1, 1) is : 87.

- (2) $\frac{i-3j-k}{\sqrt{\pi}}$ (1) $\frac{i+3j+k}{\sqrt{\pi}}$
- (3) $\frac{i+3j-k}{\sqrt{\pi}}$

(4) None of these

88. A vector \vec{f} is called an irrotational vector if :

- (2) $\nabla \cdot \vec{f} = 0$ (1) div curl $\vec{f} = 0$
- (3) $\nabla \times \vec{f} = 0$ (4) none of these
- Which of the following is *not* true ? 89.
 - (2) div (grad ϕ) = 0 (1) curl (grad ϕ) = 0
 - (3) div (curl \vec{f}) = 0

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)

(4) curl $(\overrightarrow{r}) = 0$



- (1) A line integral and a volume integral
- (2) A surface integral and a volume integral
- (3) A line integral, a surface integral and a volume integral
- (4) A line integral and a surface integral
- Co-efficient of the vector (5, -1, 2) w. r. t. basis (1, 4, 2), (4, 2, 1), (2, 1, 3) are : 91.
 - (2) (-1, 1, 1)(1) (1, 1, 1)
 - (4) None of these (3) (1, 2, 3)
- 92. Which is an orthogonal set?
 - (1) $\{(1, 0, 1), (1, 0, -1), (0, 1, 0)\}$
 - $(2) \ \{(1,0,1), (1,0,-1), (0,3,4)\}\$
 - $(3) \ \{(1,0,1), (1,0,-1), (-1,0,1)\}\$
 - (4) None of these
- **93.** Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be linear transformation defined by $T(x_1, x_2) = (x_1 x_2, x_2 x_1, x_1)$. The nullty *T* is :
 - (2) 1 (1) 2
 - (4) None of these (3) 0
- **94.** Let $F: \mathbb{R}^3 \to \mathbb{R}^2$ be defined by F(x, y, z) = (1x, y + z), then :
 - (1) F is linear transformation
 - (2) F is not a linear transformation
 - (3) *F* is invertible
 - (4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)



95. Let V(F) be the vector space of all polynomial in x in which an inner product is defined by $(f,g) = \int_{0}^{1} f(x)g(x)dx$. Then for f(x) = x + 2, $g(x) = x^{2} - 2x - 3$, $\langle f, g \rangle$ is equal to :

(1) $\frac{5}{2}$ (2) $\frac{5}{8}$ (3) $\frac{37}{4}$ (4) $-\frac{37}{4}$

96. The linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ defined by T(1, 0) = (2, 3), T(0, 1) = (5, 6) is :

(1) one one and onto (2) one one but not onto

- (3) onto but not one one (4) none of these
- **97.** Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ be defined by T(x, y, z) = (x, y, 0) and $S: \mathbb{R}^2 \to \mathbb{R}^2$ be defined by S(x, y) = (2x, 3y), are linear transformation on the real vector spaces \mathbb{R}^3 and \mathbb{R}^2 respectively. Then which of the following is *correct* ?
 - (1) T and S are both singular
 - (2) *T* and *S* are both non-singular
 - (3) *T* is singular but *S* is non-singular
 - (4) None of these

98. The integral $\int_{0}^{1} x^{m-1} (1-x)^{n-1} dx$ is known as :

(1) Theta function

(2) Zeta function

(3) Gamma function

(4) Beta function

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)





20

99. Fourier expansion of f(x) = |x| in $[-\pi, \pi]$ is :

(1)
$$-\frac{4}{\pi} \left(\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots \right)$$

(2)
$$\frac{\pi}{2} - \frac{4}{\pi} \left(\frac{\cos x}{1} + \frac{\cos 3x}{3} + \frac{\cos 5x}{5} + \dots \right)$$

(3)
$$\frac{\pi}{2} - \frac{4}{\pi} \left(\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots \right)$$

(4) None of these

100. If the function f(z) is continuous at z_0 , then :

(1) f(z) is differentiable at z_0

(2) f(z) is not necessarily differentiable at z_0

(3) f(z) is analytic at z_0

(4) None of these

PG-EE-June, 2023/(Mathematics)(SET-X)/(D)



Q. NO.	A	В	C	D
1	1	3	4	4
2	11	1	2	1
3	3	1	3	2
4	2	4	2	2
5	4	2	4	3
6	3	3	3	4
7	2	1	3	1
8	3	3	1	2
9	2	2	1	3
10	4	4	2	4
11	4	1	4	1
12	1	11	2	2
13	2	2	3	3
14	2	3	1	4
15	3	4	1	4
16	4	3	2	3
17	1	2	3	4
18	2	1	1	1
19	3	3	2	2
20	4	4	2	2
21	4	4	1	3
22	2	3	1	1
23	3	1	3	1
24	1	2	2	4
25	1	1	4	2
26	2	2	3	3
27	3	3	2	1
28	1	1	3	3
29	2	4	2	2
30	2	4	4	4
31	4	4	1	1
32	3	1	2	1
33	1	2	3	2
34	2	2	4	3
35	1	3	4	4
36	2	4	3	3
37	3	1	4	2
38	1	2	1	1
39	4	3	2	3
40	4	4	2	4
41	4	1	4	4
42	2	2	1	3
43	3	3	3	1
44	2	4	2	2
45	4	4	1	1
46	3	3	2	2
47	3	4	4	3
48	1	1	4	1
49	1	2	3	4
50	2	2		4
hurano	6 2023,	(bon 00- 6- 3	5 Jan Ka 27/00/20	23. Ne

6/2023

51 52 53 54 55 56 57 58 59 60 61 62	1 1 2 3 4 3 2 1 3 4 4 4 1	4 1 3 2 1 2 4 4 3 1 2	4 3 1 2 1 2 3 3 1 4	4 2 3 1 1 2 3
52 53 54 55 56 57 58 59 60 61 62	1 2 3 4 3 2 1 3 4 4 4 4 1	1 3 2 1 2 4 4 3 1 2	3 1 2 1 2 3 1 4	2 3 1 1 2 3
52 53 54 55 56 57 58 59 60 61 62	2 3 4 3 2 1 3 4 4 4 4 1	3 2 1 2 4 4 3 1	1 2 1 2 3 1 4	3 1 1 2 3
54 55 56 57 58 59 60 61 62	3 4 3 2 1 3 4 4 4 1	2 1 2 4 4 3 1	2 1 2 3 1 4	1 1 2 3
55 56 57 58 59 60 61 62	4 3 2 1 3 4 4 4 1	1 2 4 4 3 1	1 2 3 1 4	1 2 3
56 57 58 59 60 61 62	3 2 1 3 4 4 4 1	2 4 4 3 1	2 3 1 4	2 3 1
57 58 59 60 61 62	2 1 3 4 4 1	2 4 4 3 1	3 1 4	3
57 58 59 60 61 62 63	1 3 4 4 1	4 3 1	<u> </u>	1
58 59 60 61 62 63	1 3 4 4 1	3 1 2	4	
59 60 61 62 63	4 4 4 1	1	4	2
60 61 62 63	4 4 1	1	1	2
61 62	4			<u> </u>
62	1	2	3	4
62 1	-	1	1	2
05	3	3	1	3
64	2	2	4	2
65	1	4	2	4
66	2	1	3	3
67	4	- 3	1	3
68	4	4	3	1
69	3	3	2	1
70	1	2	4	2
71	3	4	2	4
72	1	2	1	1
73	1	3	3	3
74	4	2	2	2
75	2	4	4	1
76	3	3	1	2
77	1	3	3	4
78	3	1	4	4
79	2	1	3	3
80	<u> </u>	2	2	1
81	2	<u> </u>	4	1
82	1	2	1	1
02	2	2	2	3
03		1	2	2
04	2	1	2	Δ
00	4	⊥ 	<u>з</u>	2
00	<u>1</u>	2		
8/	3	3	1 7	2
88	4	1	2	
89	3	2	3	<u> </u>
90	2	2	4	4
91	1	1	1	2
92	2	1	1	
93	3	3	2	3
94	4	2	3	2
95	4	4	4	4
96	3	3	3	1
97	4	2	2	3
98	1	3	1	4
99	2	2	3	3
100	N 2	4	4	2
	22	Nuna :	> faile	12023. Neha Phogat