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Code

Time: 11/4 Hours	Total Quest	tions: 100	Max. Marks: 100
Roll No.	(in figure)	(2) -1, -	(in words)
Name:		_ Father's Name:_	13.7411
Mother's Name:	reconstitution (II)	_ Date of Examinati	on:

(Signature of the candidate)

(Signature of the Invigilator)

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

All questions are compulsory.

The candidates must return the Question book-let as well as OM 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.

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the candidate.

Question Booklet along with answer key of all the A,B,C and D code will be uploaded on the university website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing within 24 hours of uploading the same on the University Website. 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 book-let itself. Answers

MUST NOT be ticked in the Question book-let.

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.

Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-

Sheet.

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Question No.	enoties Questions inoliasmy
7,eia. 1.	The infimum and the supremum of the set $\left\{\frac{(-1)^n}{n}: n \in \mathbb{N}\right\}$ are respectively
	(1) $1, \frac{-1}{2}$ (2) $-1, \frac{1}{2}$
Ison III	(3) at -1, 0 an and sta privolton (4) None of these 11 areduind
2.	Which of the following sequence is divergent?
(8)	(1) $a_n = 1 + \frac{2}{n}$ (2) $b_n = \frac{3n-1}{1+2n}$ (2)
	(3) $c_n = 1 + \frac{(-1)^n}{n}$ (4) $d_n = \sin n$
3.	Consider the statements:
0. ni inogr	(a) The series $\frac{1}{3} - \frac{2}{5} + \frac{3}{7} - \frac{4}{9} + \dots$ is convergent.
	(b) The series $1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \dots$ is convergent.
gent on	
	(1) Both the statements (a) and (b) are true
riegrov	(2) The statement (a) is true and (b) is false
1	(3) The statement (a) is false and (b) is true
	(4) Neither (a) nor (b) is true

Question No.	Questions
4.	Every bounded sequence has at least one limit point. This represents
	(1) Archimedean Property (2) Heine-Borel theorem
· /*	(3) Bolzano-Weierstress theorem (4) Denseness Property
5.	Let $f:[0,\infty)\to R$ be a function, where R denotes the set of all real numbers. Then which one of the following statements is true?
	(1) If f is continuous and $\lim_{x\to\infty} f(x)$ is finite, then f is uniformly continuous.
	(2) If f is bounded and continuous, then f is uniformly continuous.
	(3) If f is uniformly continuous, then $\lim_{x\to\infty} f(x)$ exists.
	(4) None of these
6.	Which of the following is false?
	(1) The sequence $\{f_n\}$, where $f_n(x) = \frac{1}{x+n}$, is uniformly convergent in
1 7 7 1 K	any interval $[0, b]$, $b > 0$.
530	(2) The sequence $\{f_n\}$, where $f_n(x) = \frac{n^2x}{1+n^3x^2}$, is uniformly convergent or
	the interval [0,1] as (d) bas (s) attenual as eds does (f)
	(3) The sequence $\{f_n\}$, where $f_n(x) = \tan^{-1} nx$, $x \ge 0$, is uniformly convergent in any interval $[a, b]$, $a > 0$.
	(4) None of these

Question No.	Questions Questions
7.	For which of the following function, Rolle's theorem is not applicable?
	(1) $f(x) = \cos 2x \text{ in } [-\pi/4, \pi/4]$ (2) $f(x) = \frac{\sin x}{e^x} \text{ in } [0, \pi]$
	(3) $f(x) = x^3 - 6x^2 + 11x - 6 \text{ in } [1,3]$ (4) $f(x) = x \text{ in } [-1,1]$
8. (1.4 x	If f (x) = x, x ∈ [0, 1] and let P = $\left\{0, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1\right\}$ be the partition of [0, 1], then U (f, P) is
	(1) 23/36 (2) 31/36 (3) 49/36 (4) None of these
	(3) 49/36 (4) None of these
9.	If a function f defined on [0, 1] as $f(x) = \begin{cases} \sin\left(\frac{1}{x}\right), & \text{if } x \text{ is irrational} \\ 0, & \text{otherwise} \end{cases}$, then
	(1) f is not bounded
thiog of	(2) f is R-integrable
ei aixe-x	(3) f is not R-integrable since f is not bounded
	(4) f is not R-integrable since lower and upper integrals of f are unequal
	pesd) to anovi (1) Vone of these

uestion No.	Questions
10.	Consider the following improper integrals
	$I_1 = \int_0^\infty \frac{\sin^2 x}{x^2} dx \text{ and } I_2 = \int_1^\infty \frac{x^3}{(1+x)^5} dx$, then
	(1) Both are divergent (2) I ₁ converges but not I ₂
	(3) I ₂ converges but not I ₁ (4) Both are convergent
11. [1.0] 1	Which of the following functions is not a function of bounded variation? (1) $f(x) = \begin{cases} x \sin(\pi/x), & \text{if } 0 < x \le 1 \\ 0, & \text{if } x = 0 \end{cases}$ (2) $f(x) = \begin{cases} x^2 \sin(1/x), & \text{if } x \ne 0 \\ 0, & \text{if } x = 0 \end{cases}$
	(3) $f(x) = 3x^2 - 2x^3, -2 \le x \le 2$ (4) None of these
12.	Choose the incorrect statement.
6,	(1) The set of all irrational numbers in [0, 1] is measurable.
ment	(2) Every non-empty one set has p
1	(3) Every subset of a set of measure zero is not of measure zero.
	(4) None of these
13.	The directional derivative of the function ϕ (x, y) = $\frac{xy}{x^2 + y^2}$ at the point (0, 1) along a line making an angle of 30° with positive direction of x-axis is
918.1	(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{\sqrt{3}}{2}$ isometric of the state
	(3) $\sqrt{3}$ (4) None of these

Question No.	Questions
14.	The metric space (R, d), where d is a usual metric, is (1) compact (2) disconnected (3) connected but not compact (4) compact and connected
15.	In a metric space (0, 1] with usual metric d (x, y) = x-y , the sequence <\frac{1}{n} > is a (1) Not a Cauchy sequence (2) Cauchy sequence but does not converge in (0, 1] (3) Cauchy sequence that is convergent in (0, 1] (4) None of these
16.	Let V be a vector space over R^3 . Which one of the following is not a subspace of V? (1) $\{(x, y, z) : 3x + y - z = 0, x, y, z \in R\}$ (2) $\{(x, y, z) : x + y - z = 0, 2x + 3y - z = 0, x, y, z \in R\}$ (3) $\{(x, y, z) : x - 3y + 4z = 0, x, y, z \in R\}$ (4) $\{(x, y, z) : x + y \ge 0, x, y, z \in R\}$
17.	The value of k for which the vector $\mathbf{u} = (1, \mathbf{k}, 5)$ in \mathbf{V}_3 (R) can be expressed as a linear combination of vectors $\mathbf{v} = (1, -3, 2)$ and $\mathbf{w} = (2, -1, 1)$ is (1) 3 (2) -8 (3) -2 (4) None of these

estion No.	Questions
18.	The dimension of the subspace W of \mathbb{R}^4 generated by $\{(3, 8, -3, -5), (1, -2, 5, -3), (2, 3, 1, -4)\}$ is (2) 3
naupw	(1) 1 (3) 2 (4) None of these
19.	The rank of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ -3 & -6 & -3 \\ 5 & 10 & 5 \end{bmatrix}$ is
	(2) 2 (3) 3 (4) None of these
20.	(3) 3 The system of equations $2x - 3y + z = 9$; $x + y + z = 6$; $x - y + z$ has (1) a unique solution (2) infinite solutions (3) no solution (4) none of these
21.	Consider the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$, then
bleach (1, 1)	 (1) A has no real eigen values. (2) A has both positive and negative real eigen values. (3) All real eigen values of A are positive. (4) All real eigen values of A are negative.

Question No.	Code-A
22.	Which of the following is a linear transformation?
130	(1) $T(x, y) = (1 + x, y)$ for all $(x, y) \in \mathbb{R}^2$
	(2) $T(x, y) = (x, x + y)$ for all $(x, y) \in \mathbb{R}^2$
	(3) $T(x, y) = (x^2, y)$ for all $(x, y) \in \mathbb{R}^2$
	(4) None of these (4)
23.	The matrix representing the linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ defined by $T(x_1, x_2) = (2x_2, 3x_1 - x_2)$ relative to the basis $\{(1, 3), (2, 5)\}$ is
51	(1) $\begin{bmatrix} 30 & 48 \\ 18 & 29 \end{bmatrix}$ (2) $\begin{bmatrix} -30 & 48 \\ 18 & -29 \end{bmatrix}$ (1)
mitned	(3) $\begin{bmatrix} 30 & 48 \\ -18 & -29 \end{bmatrix}$ (4) $\begin{bmatrix} -30 & -48 \\ 18 & 29 \end{bmatrix}$ (6)
24.	Let C³ be a complex inner product space.
	If the vectors $\mathbf{u}_1 = (1, 2\mathbf{i}, \mathbf{i})$, $\mathbf{u}_2 = (0, 1+\mathbf{i}, 1)$, $\mathbf{u}_3 = (2, 1-\mathbf{i}, \mathbf{i}) \in \mathbb{C}^3$, then the vector orthogonal to both \mathbf{u}_1 and \mathbf{u}_3 is
	(1) $(-3+i, -i, 1-5i)$ (2) $(-3+i, -i, 1+5i)$
AVEN A	(3) $(3 + i, -i, 1 + 5i)$ (4) None of these
25.	The quadratic form corresponding to symmetric matrix $\begin{bmatrix} 9 & 3 & -3 \\ 3 & 2 & -4 \\ -3 & -4 & 2 \end{bmatrix}$ is
	(1) $9x^2 - 2y^2 + 2z^2 - 6xy - 6xz - 8yz$
	$(2) 9x^2 + 2y^2 + 2z^2 + 6xy - 6xz - 8yz$
	(3) $9x^2 + 2y^2 - 2z^2 + 6xy + 6xz + 8yz$
	(4) None of these

uestion No.	anolise Questions
100.	The radius of convergence of the power series $\sum_{n=0}^{\infty} \frac{(n!)^2}{(2n)!} z^n$ is
26.	The radius $(x, y) = (x, x)$ for all $(x, y) \in \mathbb{R}^2$ $(x, y) = (x, x)$ $(x, y) \in \mathbb{R}^2$
	(4) None of these
e an a	(2) 9
27.	Which one of the following functions f (z), of the complex variable z, is analytic over the entire complex plane?
	analytic over the entire $f(z)$ (2) $f(z) = e^{1/z}$
	(3) $f(z) = \frac{1}{1-z}$ (4) $f(z) = \cos z$
28.	(1) $3x^2y - 6xy - 3y + y^3 + c$ (2) Solution (2) $3x^2y - 6xy + 3y - y^3 + c$ (4) None of these
29.	The value of the integral $\int_{C} \overline{z} dz$, from $z = 0$ to $z = 4 + 2i$ along the curve given by $z = t^2 + it$, is equal to the approximate and all advantages of T .
2 18	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
	(1) 3 3 10 11 12 12 12 12 12 12 12 12 12 12 12 12
	(3) $10 - \frac{4}{3}i$ (4) Notice of the second (4)

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Question No.	anolies Questions	Quesilón No.
30. 311	The value of the integral $\int_C \frac{e^{-z}}{z^2} dz$, where C is a unit circle origin, described in positive sense, is equal to (1) 0 (2) π i (3) -2π i (4) None of these	100.00
2	of the problem of a suit for the suit of t	
31.	The Laurent series expansion of $f(z) = \frac{z}{(z-1)(z-3)}$ for $0 < z $ equal to	$z-1$ ≤ 2 , is
radius ;	(1) $\frac{-3}{4} \sum_{n=0}^{\infty} \frac{(z-1)^n}{2^n} - \frac{1}{2(z-1)}$ (2) $\frac{3}{4} \sum_{n=0}^{\infty} \frac{(z-1)^n}{2^n} - \frac{1}{4(z-1)}$	olemin
radins	(3) $\frac{1}{4} \sum_{n=0}^{\infty} \frac{(z-1)^{-n}}{2^n} + \frac{(z-1)}{2}$ (4) None of these	
32.	The residue of the function $f(z) = \frac{1}{(z^2 + 1)^3}$ at $z = i$, is	85.
	(1) $\frac{3}{16i}$ (2) $\frac{3}{2i}$ (3) and only form the form (2) $\frac{3}{2i}$ (2) $\frac{3}{2i}$ (2) $\frac{3}{2i}$.86
41	(3) $\frac{4}{3i}$ anominos a (2) (4) None of these (3) (1)	

Question No.	Questions
33.	The fixed points of the Mobius transformation $w = \frac{(2+i)z-2}{z+i}$ are
	(1) i, -i (2) 0, 1 (3) -1, 1 (4) 1+i, 1-i
	71 2 sideres value of these
34.	The image of circle $ z-2 = 2$ under the Mobius transformation $w = \frac{z}{z+1}$ is a circle in w-plane with
4 % > 11	is a circle in w-plane with
	(1) Centre $\left(\frac{1}{5},0\right)$ and radius $\frac{2}{5}$ (2) Centre $\left(\frac{2}{5},0\right)$ and radius $\frac{1}{5}$
	(3) Centre $\left(\frac{1}{5}, 0\right)$ and radius $\frac{1}{5}$ (4) Centre $\left(\frac{2}{5}, 0\right)$ and radius $\frac{2}{5}$
*:	If 9 colours are used to paint 100 houses, then atleast house
35.	If 9 colours are used to paint 100 mounts will be of the same colour.
10	(1) 18 (2) 15
	(3) 12 (4) 10
36.	
1	(1) 5 solutions (2) 6 solutions (8)
- 1 W	(3) 7 solutions (4) No solution
	(3) 7 solutions (4) No solution D/URS-EE-DEC2022-(Mathematics)-Code-A

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Question No.	anolte in Questions
37.	The primitive roots of 32 are
	(1) 3, 7 (2) 2, 5
	(3) 5, 7 (4) None of these
38.	Let G = {0, 1, 2, 3, 4, 5, 6, 7} be a group under the binary operation 'addition modulo 8', then the order of element 5, is
	(1) 1 2 (2) 2 (3) (4) (4)
	(3) 4 (4) 8
39.	The centre of a non-abelian group of order 343 always has elements in its centre.
	(1) 3
	(3) 5 (4) None of these
40.	Let G be a group of order 20449. Then
	(1) G has only one Sylow-11 subgroup
	(2) G has only two Sylow-11 subgroups
	(3) G has only four Sylow-11 subgroups
olker lo	(4) None of these
41.	The non-isomorphic abelian groups of order 20 are
	$(1) Z_4, Z_2 \times Z_2 \times Z_5 \qquad \qquad (2) Z_8, Z_2 \times Z_5$
	(3) $Z_4 \times Z_5$, $Z_2 \times Z_2 \times Z_5$ (4) None of these

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Question No.	Questions
42.	Let Z [x] be the ring of polynomials over the ring of integers. Then
	(1) the ideal <x> is a prime ideal but not a maximal ideal.</x>
	(2) the ideal <x> is not a prime ideal but a maximal ideal.</x>
орегалю	(3) the ideal <x> is a prme ideal as well as a maximal ideal.</x>
114	(4) the ideal <x> is neither a prime ideal nor a maximal ideal.</x>
	Which of the following is not a unique factorization domain?
43.	Which of the following is not a unique state of the order and always has
	(1) A Euclidean ring. (2) The ring < Z, +, . > of integers.
	(3) $Z\left[\sqrt{-5}\right]$ (4) None of these
44.	Which one of the following polynomial is irreducible over the field Q of
44.	rational numbers?
	(1) $2x^5 + 15x^3 + 3x + 6$ (2) $x^3 + 3x + 1$ gayorgdus 11 wolve owt vino and O (5)
	(3) $8x^3 - 6x - 1$ (4) All of the above (8)
	The degree of splitting field of $x^4 - x^2 - 2$ over the field Q of rational
45.	numbers, is
	(1) 2 × 2 × 2 × 2 (2) (2) (3) (3) (4) (1) (4) (5) (6) (6) (6) (6) (6) (6) (6) (6) (6) (6
	(3) 2 (4) None of these

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Question No.	anoitas Questions) naiteaus
46.	Let F be a finite field and let K/F be a field extension of det the Galois group of K/F is isomorphic to (1) the cyclic group of order 6	fun
	(2) the permutation group on {1, 2, 3}	(1)
	(3) the permutation group on {1, 2, 3, 4, 5, 6}(4) the permutation group on {1}	(c)
47.	Which of the following spaces is not separable?	
	(1) R with the trivial topology	161
eupiau	(2) The Cantor set as a subspace of P	
* * * * * * * * * * * * * * * * * * * *	(3) R with the discrete topology	
on agail 9	(4) None of these	
48.	Which one of the following topological spaces is not compact	?
eupino ((1) Indiscrete topological space	(8)
1 000 00	(2) Infinite discrete topological space	
sen HVI	(3) A topological space with cofinite topology	
	(4) None of these	
49.	Let X be a topological space and U be a proper dense open Then which of the following statement is true?	
to p	(1) If X is connected, then U is connected.	
	(2) If X is compact, then U is compact.	i) I
	(3) If X\U is compact, then X is compact.	
	(4) If X is compact, then X\U is compact.	

Question No.	anortha Questions not as not a
50.	Let X and Y be two topological spaces and let $f: X \to Y$ be a continuous function. Then
	 (1) f⁻¹ (K) is connected if K ⊂ Y is connected (2) f⁻¹ (K) is compact if K ⊂ Y is compact
	(3) f (K) is connected if K ⊂ X is connected
	(4) None of these
51.	For the initial value problem (IVP) $y' = f(x, y)$, $y(0) = 0$, which of the following statement is true?
	(1) $f(x, y) = \sqrt{xy}$ satisfies Lipschitz's condition and so IVP has unique solution.
	(2) $f(x, y) = \sqrt{xy}$ does not satisfy Lipschitz's condition and so IVP has no
	solution. si soongs holgologot gaiweller and he are mid.
	(3) f (x, y) = y satisfies Lipschitz's condition and so IVP has unique solution.
	(4) f(x, y) = y does not satisfy Lipschitz's condition still the IVP has unique solution.
52.	The solution of the differential equation $\frac{dy}{dx} = 2xy$, y (0) = 1 by Picard's method upto third approximation is
45.5	method upto third approximation is
	(1) $1+x^2+\frac{x^4}{2}+\frac{x^6}{6}$ (2) $1+x^2+\frac{3x^4}{2}+\frac{x^6}{6}$
	(3) $1+x^2+\frac{x^4}{4}+\frac{x^6}{6}$ begins at (4) None of these

Question No.	Questions
53.	Using method of variation of parameters, the solution of the differential equation $y'' - 2y' = e^x \sin x$, is
	(1) $y = c_1 + c_2 e^{2x} - \frac{1}{2} e^x \sin x$ (2) $y = c_1 e^x + c_2 e^{-x} - \frac{1}{2} e^x \sin x$
	(3) $y = c_1 + c_2 e^x + \frac{1}{2} e^x \sin x$ (4) None of these
54.	Let n be non-negative integer. The eigen values of the Sturm-Liouvill problem $y'' + \lambda y = 0$ with boundary conditions $y(0) = y(2\pi)$, $y'(0) = y'(2\pi)$ are
	(1) n (2) $n^2 \pi^2$
EE	(3) $n\pi$ and $n\pi$ (4) n^2 and $n\pi$ (5)
55.	Green's function of the boundary value problem
	$\frac{d^2u}{dx^2} + u = 0, \ u(0) = 0, \ u\left(\frac{\pi}{2}\right) = 0 \text{ is given by}$
	(1) $G(x, \xi) = \cos \xi \sin x$, $0 \le x < \xi$
	(2) $G(x, \xi) = \cosh \xi \sinh x$, $0 \le x < \xi$
	 (3) G (x, ξ) = x (1 - ξ), 0 ≤ x < ξ (4) None of these
56.	The solution of Partial differential equation $xz p + yz q = x y$ is
	(1) $\phi(xy, yz - y^2) = 0$ (2) $\phi(x/y, z + y^2) = 0$
	(3) $\phi(x/y, xy - z^2) = 0$ (4) None of these

Question No.	. another Questions
57.	The integral surface for the Cauchy problem $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 1$ which passes through the circle $z = 0$, $x^2 + y^2 = 1$ is (1) $x^2 + y^2 + 2z^2 + 2zx - 2yz - 1 = 0$ (2) $x^2 + y^2 + 2z^2 + 2zx + 2yz - 1 = 0$
allivaoid nel V	(2) $x^2 + y^2 + 2z^2 + 2zx + 2yz - 1 = 0$ (3) $x^2 + y^2 + 2z^2 - 2zx - 2yz - 1 = 0$ (4) None of these
58.	The partial differential equation $(x+1)\frac{\partial^2 u}{\partial x^2} - 2(x+2)\frac{\partial^2 u}{\partial x \partial y} + (x+3)\frac{\partial^2 u}{\partial y^2} = 0$ is (1) Elliptic (2) Hyperbolic (3) Parabolic (4) None of these
59.	(3) Parabolic (4) None of these Using method of separation of variables, the solution of Partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$
53.	subject to the boundary conditions: $u(0, y) = \sin y \text{ for all } y$ and $u(\infty, y) = 0 \text{ for all } y$ is given by $(1) u(x, y) = e^{-x} \sin y$ $(2) u(x, y) = e^{x} \sin y$

Question No.	Code-								
60.	Let u (x, t) = e^{iwx} v (t) with v (0) = 1 be a solution to $\frac{\partial u}{\partial t} = \frac{\partial^3 u}{\partial x^3}$. Then								
50	(1) $u(x, t) = e^{i w(x - w^2 t)}$ (2) $u(x, t) = e^{i w x - w^2 t}$ (3) $u(x, t) = e^{i w(x + w^2 t)}$ (4) $u(x, t) = e^{i w^3 (x - t)}$								
61.	(3) $u(x, t) = e^{i w(x + w^2t)}$ (4) $u(x, t) = e^{i w^3(x - t)}$ Using Newton Raphson's method, the smallest positive root of the equation $3x^3 - 9x^2 + 8 = 0$, lying between 1 and 2, is								
	(1) 1.0327 (2) 1.2261 (3) 1.6514 (4) None of these								
62. sulav	Using Gauss Elimination method, the solution of following equations $4x + 3y + 2z = 8$, $x + y + 2z = 7$, $3x + 2y + 4z = 13$ is given by								
	(1) $x = -1$, $y = 2$, $z = 3$ (2) $x = 1$, $y = 2$, $z = 3$ (3) $x = -1$, $y = -2$, $z = 3$ (4) $x = 1$, $y = -2$, $z = 3$								
63.	Given that $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								
	(1) 5 (2) 1 (3) -1 3 and 10 and (3) (4) -2 and 2 and (5)								

Question No.				agortas	Questi	ons		2 100	l	No.
64.	Consider the data given below:									puga a
	x	0	1	2	3	4	5	6	7	8
	f(x)	0	4.13	7.20	9.25	10.25	10.00	9.05	7.12	6.2
noitempe	Using	Simps	on's one	third r	ule, the	value o	$\int_{0}^{8} f(x)$	dx is	tiaU 8x ⁴	.18
	(1) 3	4.5		1.22	(2)	47.3		7120.1		
58	(3) 5	2.8	of the	None	(4)	60.4	234	1.6811	(8)	
65.	Given $\frac{dy}{dx} = -y$ with y (0) = 1. Then using Euler's method, the value of y (0.02) by taking step size h = 0.01, is									
	(1)	3.6845			(2)	2.786	2			
59.	(3)	0.9801		ivahon 1=x	(4)	0.540	1	Leex	(8)	
66.	The Euler's equation corresponding to the functional									
86.	$\int_{0}^{\pi} (y')^{2}$	$^{2}-y^{2}+$	4y cos x	dx sub), y (π) =			
	(1)	$\frac{d^2y}{dx^2} +$	y = 2 si	A REAL PROPERTY.	2		+y=2		r on T	
	(0)	d ² y	v = 9 to	n x	(2)	4) Non	ne of the	se		

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Code-A
The extremal of the functional
$I[y(x)] = \int_{1}^{2} (y'^2 - 2xy) dx$ subject to $y(1) = 0$, $y(2) = -1$ is
(1) $y = \frac{1}{6} (x - x^3)$ (2) $y = x^2 - 1$
(3) $y = \frac{1}{6} (7x - x^3)$ (4) None of these
The extremal of $\int_{1}^{2} \frac{\dot{x}^2}{t^3} dt$; $x(1) = 3$, $x(2) = 18$ (where $\dot{x} = \frac{dx}{dt}$) using
Lagrange's equation is given by which of the following?
(1) $x = \frac{15}{7}t^3 + \frac{6}{7}$ (2) $x = 5t^2 - 2$
(3) $x = 5t^3 + 3$ (4) $x = t^4 + 2$
The solution of the linear integral equation
$\phi(x) = (1+x)^2 + \int_{-1}^{1} (x\xi + x^2\xi^2) \phi(\xi) d\xi$, is
(1) $\phi(x) = 1 + 6x + \frac{25}{9}x^2$ (2) $\phi(x) = 1 - 6x + \frac{5}{9}x^2$
(3) $\phi(x) = 1 + 3x - \frac{25}{9}x^2$ (4) None of these

Question No.	Questions
70.	The solution to the integral equation $\phi(x) = x + \int_{0}^{x} \sin(x - \xi) \phi(\xi) d\xi$ is
	given by $t = 0$ (2) $t = 0$ (1) t or designate t
	(1) $x^2 + \frac{x^3}{3}$ (2) $x - \frac{x^3}{3!}$
	(3) $x^2 - \frac{x^3}{3!}$ (4) $x + \frac{x^3}{3!}$
71.	The resolvent kernel for the integral equation
gnieu	$\phi(x) = 29 + 6x + \int_{0}^{x} [5 - 6(x - \xi)] \phi(\xi) d\xi, \text{ is}$ $(1) 9 e^{3(x - \xi)} - 4 e^{2(x - \xi)} $ $(2) 9 e^{2(x - \xi)} - 4 e^{3(x - \xi)}$ $(3) 9 e^{3(x - \xi)} - e^{-2(x - \xi)} $ $(4) \text{None of these}$
72.	Consider the two dimensional motion of a mass m attached to one end a spring whose other end is fixed. Let k be the spring constant. The kinet energy T and the potential energy V of the system are given by
	ellers, - see
	$T = \frac{1}{2} m (\dot{r}^2 + (r\dot{\theta})^2) \text{ and } V = \frac{1}{2} k r^2,$
	$T = \frac{1}{2} m (\dot{r}^2 + (r\dot{\theta})^2)$ and $V = \frac{1}{2} k r^2$,

Question No.	Code-A
73.	The Lagrange's equation for a simple pendulum is, (where symbols have their usual meanings)
	(1) $\dot{\theta} + \frac{g}{\ell} \sin \theta = 0$ (2) $\ddot{\theta} + \frac{g}{\ell} \sin \theta = 0$ (3)
aly 25% 2% are product. that it is	(3) $\ddot{\theta} + \frac{g}{\ell} \tan \theta = 0$ (4) None of these bons was a substantial and a substantial description of the second substantial and a substantial description of the second substantial description description of the second substantial description descr
74.	Let q_i and \dot{q}_i respectively are the generalized coordinates and velocity of a mechanical system and p_i are its generalized momenta. If H is the Hamiltonian of the system, then Hamilton's equations of motion are
iosasima	(1) $\dot{q}_i = \frac{\partial H}{\partial p_i}, \dot{p}_i = \frac{\partial H}{\partial q_i}$ (2) $\dot{q}_i = -\frac{\partial H}{\partial p_i}, \dot{p}_i = \frac{\partial H}{\partial q_i}$
	(3) $\dot{q}_i = \frac{\partial H}{\partial p_i}, \dot{p}_i = -\frac{\partial H}{\partial q_i}$ (4) $\dot{q}_i = -\frac{\partial H}{\partial p_i}, \dot{p}_i = -\frac{\partial H}{\partial q_i}$
75.	If $L = [L_1, L_2, L_3]$ is the vector moment of the external forces about a fixed point O , $\omega = [\omega_1, \omega_2, \omega_3]$ the angular velocity, and A , B , C are the principal moments of inertia, then Euler's dynamical equations of motion are
	(1) $L_1 = A\omega_1 - (B - C)\omega_2\omega_3$, $L_2 = B\omega_2 - (C - A)\omega_3\omega_1$, $L_3 = C\omega_3 - (A - B)\omega_1\omega_2$
	(2) $L_1 = A\dot{\omega}_1 - (B - C)\omega_2\omega_3$, $L_2 = B\dot{\omega}_2 - (C - A)\omega_3\omega_1$, $L_3 = C\dot{\omega}_3 - (A - B)\omega_1\omega_2$
	(3) $L_1 = A\dot{\omega}_1 + (B - C)\omega_2\omega_3$, $L_2 = B\dot{\omega}_2 + (C - A)\omega_3\omega_1$, $L_3 = C\dot{\omega}_3 + (A - B)\omega_1\omega_2$
	(4) None of these (A)

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Question No.	agostas Questions and agostas Questions
76.	An integer is chosen at random from two hundred digits. Then the probability that the integer is divisible is divisible by 6 or 8 is (1) 3/4 (2) 1/2 (3) 3/8 (4) 1/4
77.	In a bolts factory, machines I, II and III manufacture respectively 25%, 35% and 40% of the total bolts. Of their total output 5%, 4% and 2% are respectively defective bolts. A bolt is drawn at random from the product. If the bolt drawn is found to be defective, what is the probability that it is manufactured by machine II?
are are	(1) 0.41 (2) 0.27 (3) 0.13 (4) None of these
78.	Let X be a continuous random variable with probability density function (p.d.f.) defined as $f(x) = 6x(1-x)$, $0 \le x \le 1$. Then the value of number b such that $P(X < b) = P(X > b)$ is (1) $1/4$ (2) $3/4$ (3) $1/2$ (4) None of these
79.	$f(x, y) = \begin{cases} 0 & \text{; otherwise} \\ 0 & \text{; otherwise} \end{cases}$
() () () () () ()	Then P (X + Y < 1) is (1) 1/4 (3) 3/8 (2) 1/10 (4) None of these

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Question No.	Ques Ques	etions	Quos
80.	For $k = 1, 2,, 10$, let the probab variable X_k is given by		ndom
	$f_{x_k}(x) = \begin{cases} \frac{e^{-\frac{x}{k}}}{k}, & x > 0\\ 0, & \text{otherwise} \end{cases}$	(1) 2 (1) 10 (8) (8)	PE.
Filom vi	Then the value of $E\left(\sum_{k=1}^{10} k X_k\right)$ is eq	The sum of all the element of a Markov chain isot lau	80
	(1) 385 (2)		
2, 3) wit	(3) 144 (4)	110	
	THE RESIDENCE OF THE PARTY OF THE PROPERTY OF THE PARTY OF THE	newit who will be a like to the	
81.	If 2% of the items manufactured probability that there are 3 defective	ve items in a sample of 100 item	n the
81.	If 2% of the items manufactured probability that there are 3 defective (1) 0.48 (2)	by a factory are defective, the re items in a sample of 100 item 0.33	n the
81.	probability that there are 3 defective	re items in a sample of 100 item	n the
81. borner 82.	probability that there are 3 defective (1) 0.48 (2)	0.33 0.18 ne first moment about 10 is 40 are the mean and standard deviate	s is
boring a	(1) 0.48 (2) (3) 0.27 (4) For a certain normal distribution, the fourth moment about 50 is 48. Then the distribution respectively are (1) 20, 3 (2)	0.33 0.18 ne first moment about 10 is 40 are the mean and standard deviated as 30, 4	s is
boring a	probability that there are 3 defective (1) 0.48 (2) (3) 0.27 (4) For a certain normal distribution, the fourth moment about 50 is 48. Then the distribution respectively are (1) 20, 3 (2) (3) 50, 2 (4)	0.33 0.18 ne first moment about 10 is 40 are the mean and standard deviated and the Money of these	s is
boring a	probability that there are 3 defectives (1) 0.48 (2) (3) 0.27 (4) For a certain normal distribution, the fourth moment about 50 is 48. Then the distribution respectively are (1) 20, 3 (2) (3) 50, 2 (4) The characteristic function of χ^2 -di	0.33 0.18 ne first moment about 10 is 40 are the mean and standard deviated and the mean and the	s is
82.	probability that there are 3 defectives (1) 0.48 (2) (3) 0.27 (4) For a certain normal distribution, the fourth moment about 50 is 48. Then the distribution respectively are (1) 20, 3 (2) (3) 50, 2 (4) The characteristic function of χ^2 —distribution of χ^2 —	0.33 0.18 ne first moment about 10 is 40 are the mean and standard deviate 30, 4 None of these stribution with n degrees of free (1 + 2it) ^{n/2}	s is

Question No.	Questions Questions
84.	If Tchebycheff's inequality for a random variable X with mean 12 is $P\{6 < X < 18\} \ge \frac{3}{4}, \text{ then the standard deviation of X is}$
	(1) 2 (3) 8 (2) 3 (4) None of these
	(3) 8
85.	The sum of all the elements of any row of the transition probability matrix of a Markov chain is (1) 0 (2) 1 (3) 2 (4) None of these
86.	Consider a discrete time Markov chain on the state space $\{1, 2, 3\}$ with one-step transition probability matrix $\begin{bmatrix} 0 & 0.2 & 0.8 \\ 0.5 & 0 & 0.5 \\ 0.6 & 0.4 & 0 \end{bmatrix}$. Then the period of the Markov chain is
and the otion of	(1) 3 ode treament and edd mon (2) 2 b languog nietus a roll (2) (2) (2) languog nietus a roll (2) (2) (2) languog nietus a roll (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)
87.	Let $\{X_t\}$ and $\{Y_t\}$ be two independent pure birth processes with birth rat λ_1 and λ_2 respectively. Let $Z_t = X_t + Y_t$. Then (1) $\{Z_t\}$ is not a pure birth process.
mobasy	 (1) {Z_t} is not a pure birth process with birth rate λ₁ + λ₂. (2) {Z_t} is a pure birth process with birth rate min (λ₁, λ₂). (3) {Z_t} is a pure birth process with birth rate λ₁ λ₂. (4) {Z_t} is a pure birth process with birth rate λ₁ λ₂.

Question No.	Questions Questions
88.	Let X and Y be independent and identically distributed (i.i.d.) random variables uniformly distributed on (0, 4). Then P (X > Y X < 2 Y) is
Tsqui	(1) 2/3 (2) 5/6 (3) 1/4 (4) 1/3
	(3) 1/4 (4) 1/3
89.	If X and Y are independent normal variates with zero expectations and
ed ing	variances σ_1^2 and σ_2^2 , then $Z = \frac{XY}{\sqrt{X^2 + Y^2}}$ is normal with variance
	(1) $\sigma_z^2 = \frac{1}{\left(\frac{1}{\sigma_1^2} + \frac{1}{\sigma_2^2}\right)}$ (2) $\sigma_z^2 = \sigma_1^2 + \sigma_2^2$
	(3) $\sigma_z^2 = \frac{1}{\sigma_1^2} + \frac{1}{\sigma_2^2}$ (4) None of these
90.	In testing H: μ = 100 against A: $\mu \neq$ 100 at the 10% level of significance, H is rejected if
	(1) 100 is contained in the 90% confidence interval
	(2) The value of the test statistic is in the acceptance region
	(3) The p-value is less than 0.10 main trade was and x x (c)
	(4) The p-value is greater than 0.10 (4) (4) (4) (4) (4) (4) (4) (4) (4) (4)
	(4) X + X and X, - X, are independently distributed.

Question No.	Questions
NO.	Let p be the probability that a coin will fall head in a single toss in order
91.	to test $H_0 = p = \frac{1}{2}$ against $H_1 : p = \frac{3}{4}$. The coin is tossed 5 times and $H_0 = \frac{3}{4}$ rejected if more than 3 heads are obtained. Then the probability of type I error is
	(2) 3/16
	(4) None of these
92.	Given the observations 0.8, 0.71, 0.9, 1.2, 1.68, 1.4, 0.88, 1.62 from the uniform distribution on $(\theta - 0.2, \theta + 0.8)$ with $-\infty < \theta < \infty$, which of the following is a maximum likelihood estimate for θ ?
	(2) 0.5
1	(3) 1.1 (4) 1.3 normal population
00	(3) 1.1 If X ₁ , X ₂ , X ₃ ,, X _n is a random sample from a normal population
93.	N (μ , 1). Then $t = \frac{1}{n} \sum_{i=1}^{n} X_i^2$ is a unbiased estimator of (2) $\mu^2 - 1$
	(4) $u^- + 1$
94.	 (3) 1-μ² Let X₁, X₂,, X_n be a random sample of size n from a p-variate Normal distribution with mean μ and positive definite covariance matrix Σ Choose the correct statement (1) (X₁-μ)' Σ⁻¹(X₁-μ) has chi-square distribution with 1 d.f.
	(2) $\overline{X} \overline{X}'$ has Wishart distribution with p d.f.
	(3) $\sum_{i=1}^{n} (X_i - \mu)(X_i - \mu)'$ has Wishart distribution with n d.f.
	(4) $X_1 + X_2$ and $X_1 - X_2$ are independently distributed.

Ques Ques	tions Code-A
	$\sigma_2 = \sigma_3 = 3$, $r_{12} = 0.7$, $r_{23} = r_{31} = 0.5$
(1) 0.1423 (2)	
(3) 0.4892 (4)	None of these
The total number of all possible Lat	in squares of order 3 is
(1) 12 (2)	9 (8)
(3) 6 noseio I ad at hershismon (4)	None of these deleving 1001
The Mean time to failure (MTTF) f parameter λ is	
(1) λ (2)	λ^2 $\frac{c}{c}$ (1)
(3) $1/\lambda$ (4)	None of these
The maximum value of $Z = 2x + 3y$	6 (8)
subject to the constraints:	
$x + y \le 30$; $3 \le y \le 12$; $x - y \ge 0$;	$0 \le x \le 20$, is
(1) 72 (2)	60
(3) 49	None of these
	In a trivariate distribution: $\sigma_1 = 2$, Then $R_{1.23}$ is (1) 0.1423 (2) (3) 0.4892 (4) The total number of all possible Latter (1) 12 (2) (3) 6 (4) The Mean time to failure (MTTF) for parameter λ is (1) λ (2) (3) $1/\lambda$ (4) The maximum value of $Z = 2x + 3y$ subject to the constraints: $x + y \le 30$; $3 \le y \le 12$; $x - y \ge 0$; (1) 72 (2)

No.	Questions
99.	Men arrive in a queue according to a Poisson process with rate λ_1 and women arrive in the same queue according to another Poisson process with rate λ_2 . The arrivals of men and women are independent. The probability that the first arrival in the queue is a man is $(1) \frac{\lambda_1}{\lambda_1 + \lambda_2} \qquad (2) \frac{\lambda_2}{\lambda_1 + \lambda_2}$
08.	(3) $\frac{\lambda_1}{\lambda_2}$ (4) $\frac{\lambda_2}{\lambda_1}$
100.	Arrivals at a telephone booth are considered to be Poisson with an average
Aftiw-1	Arrivals at a telephone booth are considered to be 1 of soft with the length of time of 12 minutes between one arrival and the next. The length of time of 12 minutes between one arrival and the next mean 4 minutes phone call is assumed to be distributed exponentially with mean 4 minutes phone call is assumed to be distributed exponentially with mean 4 minutes are the probability that a person arriving at the booth will have to was in the queue is (1) $\frac{2}{3}$ (2) $\frac{1}{3}$

SET-"X"

(Total No. of printed pages: 29) PEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

(PHD/URS-EE-DEC.-2022) **MATHEMATICS** Sr. No Time: 11/4 Hours Total Questions: 100 Max. Marks: 100 Roll No. (in figure)_ (in words) Name: 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. All questions are compulsory. The candidates must return the Question book-let as well as C answer-sheet to the Invigilator concerned before leaving the Examination failing which a case of use of unfair-means / mis-behaviour will be regist against him / her, in addition to lodging of an FIR with the police. Further answer-sheet of such a candidate will not be evaluated. Keeping in view the transparency of the examination system, carbonless U. Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by Question Booklet along with answer key of all the A,B,C and D code will be uploaded on the university website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing within 24 hours of uploading the same on the University Website. 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 book-let itself. Answers MUST NOT be ticked in the Question book-let. 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. Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-7. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

Question No.	anoises Questions 7. noises
o 1 ,5ols H is th	The resolvent kernel for the integral equation
SPER I	$\phi(x) = 29 + 6x + \int_{0}^{x} [5 - 6(x - \xi)] \phi(\xi) d\xi$, is
	(1) $9 e^{3(x-\xi)} - 4 e^{2(x-\xi)}$ (2) $9 e^{2(x-\xi)} - 4 e^{3(x-\xi)}$ (3) $9 e^{3(x-\xi)} - e^{-2(x-\xi)}$ (4) None of these
2.	Consider the two dimensional motion of a mass m attached to one end a spring whose other end is fixed. Let k be the spring constant. The kinet energy T and the notantial energy V of the
princip n are	$T = \frac{1}{2} m \left(\dot{r}^2 + (r\dot{\theta})^2 \right) \text{ and } V = \frac{1}{2} k r^2, \text{and } [\omega, \omega, \omega] = \omega \text{ O taking}$
-B) 01 -B) 01	where $\dot{\mathbf{r}} = \frac{d\mathbf{r}}{dt}$ and $\dot{\theta} = \frac{d\theta}{dt}$ with t as time. (1)
(-B) or	Then which of the following statement is correct?
	(1) r is an ignorable coordinate
estad Ti	(2) θ is not an ignorable coordinate
********	(3) r² θ remains constant throughout the motion
	(4) r θ remains constant throughout the motion
3.	The Lagrange's equation for a simple pendulum is, (where symbols have their usual meanings)
	(1) $\dot{\theta} + \frac{g}{\ell} \sin \theta = 0$ (2) $\ddot{\theta} + \frac{g}{\ell} \sin \theta = 0$
	(3) $\ddot{\theta} + \frac{g}{\ell} \tan \theta = 0$ (4) None of these (5)

Question No.	Questions Questions No.
4.	Let q_i and \dot{q}_i respectively are the generalized coordinates and velocity of a mechanical system and p_i are its generalized momenta. If H is the Hamiltonian of the system, then Hamilton's equations of motion are
	(1) $\dot{q}_i = \frac{\partial H}{\partial p_i}, \dot{p}_i = \frac{\partial H}{\partial q_i}$ (2) $\dot{q}_i = -\frac{\partial H}{\partial p_i}, \dot{p}_i = \frac{\partial H}{\partial q_i}$
me end o he kineti	(3) $\dot{\mathbf{q}}_{i} = \frac{\partial \mathbf{H}}{\partial \mathbf{p}_{i}}, \dot{\mathbf{p}}_{i} = -\frac{\partial \mathbf{H}}{\partial \mathbf{q}_{i}}$ (4) $\dot{\mathbf{q}}_{i} = -\frac{\partial \mathbf{H}}{\partial \mathbf{p}_{i}}, \dot{\mathbf{p}}_{i} = -\frac{\partial \mathbf{H}}{\partial \mathbf{q}_{i}}$
5.	If $L = [L_1, L_2, L_3]$ is the vector moment of the external forces about a fixed point O , $\omega = [\omega_1, \omega_2, \omega_3]$ the angular velocity, and A , B , C are the principal moments of inertia, then Euler's dynamical equations of motion are
	(1) $L_1 = A\omega_1 - (B - C)\omega_2\omega_3$, $L_2 = B\omega_2 - (C - A)\omega_3\omega_1$, $L_3 = C\omega_3 - (A - B)\omega_1\omega_3$
	(2) $L_1 = A\dot{\omega}_1 - (B - C)\omega_2\omega_3$, $L_2 = B\dot{\omega}_2 - (C - A)\omega_3\omega_1$, $L_3 = C\dot{\omega}_3 - (A - B)\omega_1\omega_2$ (3) $L_1 = A\dot{\omega}_1 + (B - C)\omega_2\omega_3$, $L_2 = B\dot{\omega}_2 + (C - A)\omega_3\omega_1$, $L_3 = C\dot{\omega}_3 + (A - B)\omega_1\omega_2$ (4) None of these
6.	An integer is chosen at random from two hundred digits. Then the probability that the integer is divisible is divisible by 6 or 8 is
w.	(1) 3/4 (2) 1/2
ad alodn	(3) 3/8) ai mulubneg sigmia a (4) a 1/4 ans a sprace and series.
7.	In a bolts factory, machines I, II and III manufacture respectively 25% 35% and 40% of the total bolts. Of their total output 5%, 4% and 2% are respectively defective bolts. A bolt is drawn at random from the product If the bolt drawn is found to be defective, what is the probability that it is manufactured by machine II?
	(1) 0.41 (2) 0.27 (3) 0.13 (4) None of these

Question No.	Questions Code-B
8.	(p.d.f.) defined as $f(x) = 6x(1-x)$, $0 \le x \le 1$.
	Then the value of number b such that $P(X < b) = P(X > b)$ is (1) $1/4$ (2) $3/4$
P has no	(3) 1/2 (4) None of these
9. ospimu e and TVI	If X and Y are two random variables having joint density function given by $f(x,y) = \begin{cases} 6x^2y \; ; \; 0 < x < 1, 0 < y < 1 \\ 0 \qquad ; \; otherwise \end{cases}$ Then $P(X+Y<1)$ is
Pioned	(1) 1/4 (2) 1/10 (3) 3/8 (4) None of these
10.	For k = 1, 2,, 10, let the probability density function of the random variable X_k is given by $f_{x_k}(x) = \begin{cases} \frac{e^{-\frac{x}{k}}}{k}, & x > 0 \\ 0, & \text{otherwise} \end{cases}$
	Then the value of $E\left(\sum_{k=1}^{10}kX_k\right)$ is equal to $(1) 385 \qquad \qquad (2) 256$ $(3) 144 \qquad \qquad (4) 110$

Question No.	enotiesu Questions polimen Questions
n(11. ,m)	For the initial value problem (IVP) $y' = f(x, y)$, $y(0) = 0$, which of the following statement is true?
	(1) $f(x, y) = \sqrt{xy}$ satisfies Lipschitz's condition and so IVP has unique solution.
on Gyen	(2) $f(x, y) = \sqrt{xy}$ does not satisfy Lipschitz's condition and so IVP has no solution.
6.	(3) f (x, y) = y satisfies Lipschitz's condition and so IVP has unique solution.
	(4) f (x, y) = y does not satisfy Lipschitz's condition still the IVP has unique solution.
12.	The solution of the differential equation $\frac{dy}{dx} = 2xy$, y (0) = 1 by Picard's method upto third approximation is
erobnes	(1) $1+x^2+\frac{x^4}{2}+\frac{x^6}{6}$ (2) $1+x^2+\frac{3x^4}{2}+\frac{x^6}{6}$
	(3) $1+x^2+\frac{x^4}{4}+\frac{x^6}{6}$ (4) None of these
13.	Using method of variation of parameters, the solution of the differential equation $y'' - 2y' = e^x \sin x$, is
	(1) $y = c_1 + c_2 e^{2x} - \frac{1}{2} e^x \sin x$ (2) $y = c_1 e^x + c_2 e^{-x} - \frac{1}{2} e^x \sin x$
	(3) $y = c_1 + c_2 e^x + \frac{1}{2} e^x \sin x$ (4) None of these

Question No.	anoits of Questions , pultage of the contract
14.	Let n be non-negative integer. The eigen values of the Sturm-Liouville problem $y'' + \lambda y = 0$ with boundary conditions $y(0) = y(2\pi)$, $y'(0) = y'(2\pi)$ are
	 (1) n (2) n² π² (3) n π (4) n²
	(3) $n\pi$ (4) n^2
15.	Green's function of the boundary value problem
lichen bal	blactured to nonturios end selfderney to nonterraces to bodiem anisU $\frac{d^2u}{dx^2} + u = 0$, $u(0) = 0$, $u\left(\frac{\pi}{2}\right) = 0$ is given by
	(1) $G(x, \xi) = \cos \xi \sin x, 0 \le x < \xi$
	(2) $G(x, \xi) = \cosh \xi \sinh x$, $0 \le x \le \xi$
	(3) G $(x, \xi) = x (1 - \xi), 0 \le x < \xi$
	(4) None of these
16.	The solution of Partial differential equation xz p + yz q = x y is
	(1) $\phi(xy, yz - y^2) = 0$ (2) $\phi(x/y, z + y^2) = 0$
	(3) $\phi(x/y, xy - z^2) = 0$ (4) None of these
17.	The integral surface for the Cauchy problem $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 1$ which passes
Then	through the circle $z = 0$, $x^2 + y^2 = 1$ is
¥	(1) $x^2 + y^2 + 2z^2 + 2zx - 2yz - 1 = 0$
	(2) $x^2 + y^2 + 2z^2 + 2zx + 2yz - 1 = 0$
	(3) $x^2 + y^2 + 2z^2 - 2zx - 2yz - 1 = 0$
	(4) None of these

Question No.	anoitean Questions noiteau Questions
18.	The partial differential equation $(x+1)\frac{\partial^2 u}{\partial x^2} - 2(x+2)\frac{\partial^2 u}{\partial x \partial y} + (x+3)\frac{\partial^2 u}{\partial y^2} = 0$
000	is to be a figuration bigs with a condition and in IVP has intended
	(1) Elliptic (2) Hyperbolic
	(3) Parabolic (4) None of these
19.	Using method of separation of variables, the solution of Partial differential equation
	$\frac{\partial^2 \mathbf{u}}{\partial \mathbf{x}^2} + \frac{\partial^2 \mathbf{u}}{\partial \mathbf{y}^2} = 0$ $3 > \mathbf{x} \ge 0 \implies \text{min } 3 \text{ and } = (3, \mathbf{x}) \cdot 0 (1)$
	subject to the boundary conditions:
	$u(0, y) = \sin y$ for all y geeds to each (x)
	and $u(\infty, y) = 0$ for all y
	is given by $(e_y + x, y/x) \phi$ (2) $0 = (e_y - xy, yz) \phi$ (1)
	(1) $u(x, y) = e^{-x} \sin y$ (2) $u(x, y) = e^{x} \sin y$
essesq do	(3) $u(x, y) = e^{-2x} \sin y$ (4) None of these
20.	Let $u(x, t) = e^{iwx} v(t)$ with $v(0) = 1$ be a solution to $\frac{\partial u}{\partial t} = \frac{\partial^3 u}{\partial x^3}$. Then
-	(1) $u(x, t) = e^{i w(x - w^2t)}$ (2) $u(x, t) = e^{i w x - w^2t}$
	(3) $u(x, t) = e^{i w(x + w^2t)}$ (4) $u(x, t) = e^{i w^3(x - t)}$
	(4) None of these

Question No.	emoiten Questions
21.	The Laurent series expansion of $f(z) = \frac{z}{(z-1)(z-3)}$ for $0 < z-1 < 2$, is equal to
	(1) $\frac{-3}{4} \sum_{n=0}^{\infty} \frac{(z-1)^n}{2^n} - \frac{1}{2(z-1)}$ (2) $\frac{3}{4} \sum_{n=0}^{\infty} \frac{(z-1)^n}{2^n} - \frac{1}{4(z-1)}$
	(3) $\frac{1}{4} \sum_{n=0}^{\infty} \frac{(z-1)^{-n}}{2^n} + \frac{(z-1)}{2}$ (4) None of these
22.	The residue of the function $f(z) = \frac{1}{(z^2 + 1)^3}$ at $z = i$, is
	(1) $\frac{3}{16i}$ (2) $\frac{3}{2i}$ (2) $\frac{3}{2i}$
	(3) $\frac{4}{3i}$ (4) None of these
23.	The fixed points of the Mobius transformation $w = \frac{(2+i)z-2}{z+i}$ are
	(1) i, -i (2) 0, 1 (3) -1, 1 (4) 1+i, 1-i
24.	The image of circle $ z-2 =2$ under the Mobius transformation $w=\frac{z}{z+1}$
	is a circle in w-plane with
	(1) Centre $\left(\frac{1}{5},0\right)$ and radius $\frac{2}{5}$ (2) Centre $\left(\frac{2}{5},0\right)$ and radius $\frac{1}{5}$
, The state of the	(3) Centre $\left(\frac{1}{5}, 0\right)$ and radius $\frac{1}{5}$ (4) Centre $\left(\frac{2}{5}, 0\right)$ and radius $\frac{2}{5}$

uestion No.	Profiles Questions	Question No.
25.	If 9 colours are used to paint 100 houses, then atleast will be of the same colour.	houses
	(1) 18 (2) 15	
	(3) $(12)^{\frac{1}{4}}$ $(2)^{\frac{1}{4}}$ $(3)^{\frac{1}{4}}$ $(4)^{\frac{1}{4}}$ $(5)^{\frac{1}{4}}$ $(7)^{\frac{1}{4}}$ $(8)^{\frac{1}{4}}$ $(9)^{\frac{1}{4}}$ $(9)^{$	
26.	The congruence $35x \equiv 14 \pmod{21}$ has (2) 6 solutions	
	(1) 5 solutions (2) 6 solutions	
	(3) 7 solutions de (1+4s) = (4) No solution de la contraction de l	22.
27.	The primitive roots of 3 ² are (1) 3, 7 (2) 2, 5	
	(3) 5, 7 Seed to Show (4) (4) None of these (8)	
28.	Let G = {0, 1, 2, 3, 4, 5, 6, 7} be a group under the binary 'addition modulo 8', then the order of element b, is	operation
	(1) 1 (2) (2) 2	
	(3) 4 (4) 8	
29.	The centre of a non-abelian group of order 343 always has in its centre.	_elemer
avil.		
	(3) 5 (4) None of these	
auil	(3) Centre (3.0) and radius. (4) Centre (2.0) and ac	

Question No.	adoltsol Questions
30.	Let G be a group of order 20449. Then
	(1) G has only one Sylow-11 subgroup
bed	(2) G has only two Sylow-11 subgroups
pomented	(3) G has only four Sylow-11 subgroups
39,	(4) None of these
31.	Which of the following functions is not a function of bounded variation?
	(1) $f(x) = \begin{cases} x \sin(\pi/x), & \text{if } 0 < x \le 1 \\ 0, & \text{if } x = 0 \end{cases}$ (2) $f(x) = \begin{cases} x^2 \sin(1/x), & \text{if } x \ne 0 \\ 0, & \text{if } x = 0 \end{cases}$
	(3) $f(x) = 3x^2 - 2x^3, -2 \le x \le 2$ (4) None of these
32.	Choose the incorrect statement.
	(1) The set of all irrational numbers in [0, 1] is measurable.
	(2) Every non-empty one set has positive measure.
	(3) Every subset of a set of measure zero is not of measure zero.
	(4) None of these
33.	The directional derivative of the function ϕ (x, y) = $\frac{xy}{x^2 + y^2}$ at the point
	(0, 1) along a line making an angle of 30° with positive direction of x-axis is
	(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{\sqrt{3}}{2}$
	(3) $\sqrt{3}$ (4) None of these

Question No.	Code-
34.	The metric space (R, d), where d is a usual metric, is
	(1) compact (2) disconnected
	(3) connected but not compact (4) compact and connected
35.	In a metric space (0, 1] with usual metric d $(x, y) = x - y $, the sequence
	<-> is a pand to such the second (4)
ation?	(1) Not a Cauchy sequence a soul soul and woll of any to deline the sequence
16.	(2) Cauchy sequence but does not converge in (0, 1]
0=2	(3) Cauchy sequence that is convergent in (0, 1]
	(4) None of these
3%.	Let V be a vector space over R ³ . Which one of the following is not a subspace of V?
	(1) $\{(x, y, z) : 3x + y - z = 0, x, y, z \in R\}$
	(2) $\{(x, y, z) : x + y - z = 0, 2x + 3y - z = 0, x, y, z \in R\}$
	(3) $\{(x, y, z) : x - 3y + 4z = 0, x, y, z \in R\}$
	(4) $\{(x, y, z) : x + y \ge 0, x, y, z \in R\}$
37.	The value of k for which the vector $u = (1, k, 5)$ in V_3 (R) can be expressed
i sixa-xi	as a linear combination of vectors $v = (1, -3, 2)$ and $w = (2, -1, 1)$ is
-14	(1) 3 (2) -8
	(3) -2 (4) None of these
	(4) None of these

Set-X ode-B	Del-A
Question No.	Questions Questions
38.	The dimension of the subspace W of \mathbb{R}^4 generated by $\{(3, 8, -3, -5), (1, -2, 5, -3), (2, 3, 1, -4)\}$ is (1) 1 (2) 3 (3) 2 (4) None of these
39.	The rank of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ -3 & -6 & -3 \\ 5 & 10 & 5 \end{bmatrix}$ is
40	(1) 1 (3) 3 (4) None of these
40.	The system of equations $2x - 3y + z = 9$; $x + y + z = 6$; $x - y + z = 2$ has (1) a unique solution (2) infinite solutions (3) no solution (4) none of these
41.	Let p be the probability that a coin will fall head in a single toss in order to test $H_0 = p = \frac{1}{2}$ against $H_1 : p = \frac{3}{4}$. The coin is tossed 5 times and H_0 is
001	rejected if more than 3 heads are obtained. Then the probability of type I error is (1) 1/16 (2) 3/16 (3) 5/16 (4) None of these
42.	Given the observations 0.8, 0.71, 0.9, 1.2, 1.68, 1.4, 0.88, 1.62 from the uniform distribution on $(\theta - 0.2, \theta + 0.8)$ with $-\infty < \theta < \infty$, which of the following is a maximum likelihood estimate for θ ? (1) 0.7 (2) 0.9
	(3) 1.1 (4) 1.3

<u>d-900</u>		Code-F
Question No.	equities Questions	andasag No
43.	If X ₁ , X ₂ , X ₃ ,, X _n is a random sample from a normal po	nulation
	$N (\mu, 1)$. Then $t = \frac{1}{n} \sum_{i=1}^{n} X_i^2$ is a unbiased estimator of	Pulation
	(1) μ^2 (2) $\mu^2 - 1$	and -
	(3) $1-\mu^2$ (4) μ^2+1	Landa de
44.	Let X_1, X_2, \ldots, X_n be a random sample of size n from a p-variate distribution with mean μ and positive definite covariance match the correct statement	Normal trix ∑.
	 (1) (X₁ - μ)' ∑⁻¹(X₁ - μ) has chi-square distribution with 1 d.f. (2) X X' has Wishart distribution with p d.f. 	
×	(3) $\sum_{i=1}^{\infty} (X_i - \mu)(X_i - \mu)'$ has Wishart distribution with n d.f.	40.
	(4) $X_1 + X_2$ and $X_1 - X_2$ are independently distributed. (8)	
45.	In a trivariate distribution : $\sigma_1=2$, $\sigma_2=\sigma_3=3$, $r_{12}=0.7$, $r_{23}=r$ Then $R_{1.23}$ is	₃₁ = 0.5.
ogya la	(1) 0.1423 A Front Channeldo (2) 0.7211 A Front Channeldo	
	(3) 0.4892 (4) None of these	
37.	assert the article of the section and the article of the section and the section are	Since
46.	The total number of all possible Latin squares of order 3 is	
d) to day	(1) 12 0 > \alpha - distributed box (2) 9 as not undirected artificial of the first	42.
	(3) 6 (4) None of these (1)	
	(8) 1.1	

Question No.	emotives Questions	Question No.				
47.	The Mean time to failure (MTTF) for an exponential distribure parameter λ is					
	(1) λ (2) λ^2 (3) $1/\lambda$ (4) None of these (6)	y 11.6, pp.				
48.		23				
49.	Men arrive in a queue according to a Poisson process with rate women arrive in the same queue according to another Poisson p with rate λ_2 . The arrivals of men and women are independent probability that the first arrival in the queue is a man is (1) $\frac{\lambda_1}{\lambda_1 + \lambda_2}$ (2) $\frac{\lambda_2}{\lambda_1 + \lambda_2}$	process				
34.	(3) $\frac{\lambda_1}{\lambda_2}$ (4) $\frac{\lambda_2}{\lambda_1}$ (2)					
50.	Arrivals at a telephone booth are considered to be Poisson with an a time of 12 minutes between one arrival and the next. The leng phone call is assumed to be distributed exponentially with mean 4 m. Then the probability that a person arriving at the booth will have in the queue is	th of a inutes.				
	(1) $\frac{2}{3}$ 10 (2) $\frac{1}{3}$ 10 (2) $\frac{1}{3}$ 11 (2) $\frac{1}{3}$ 11 (3) $\frac{1}{6}$ (4) None of these $\frac{3.48}{3.48}$ (5)					

Question No.				engine	Ques	tions				incession No.
51.	Using Newton Raphson's method, the smallest positive root of the equation $3x^3 - 9x^2 + 8 = 0$, lying between 1 and 2, is									
		0327 0514	u f	None	(2)			ANI.	(L) Kiloni	
52.	Using (Jauss :	Elimina	ation me	thod, th	e soluti	on of fo	llowing	equation	ons
		+ 2z =		+ y + 2z					due	
	(1) x = (3) x =			z = 3			y = 2, z $y = -2,$			
53.	Given that are us marketones are appropriate and all every memory									
	X	man.	3	np 7dl p	9	e first o	10	villided		
	f(x)	1	68	120	72		63			
	The value of third divided difference of the function f(x) is									
	(1) 5									
	(3) -1			A. (1	(4)	-2				
54.	Consider the data given below:									
eatminion inw ox en	X	tonad a	aidabao	2 2	3.5	4	5	11e6	7	8
	f(x)	0	4.13	7.20	9.25	10.25	10.00	9.05	7.12	6.2
	Using Simpson's one third rule, the value of $\int_{0}^{8} f(x) dx$ is									
	 (1) 34. (3) 52. 		ds to en		(2)	47.3 60.4				

Question No.	Questions Questions
55.	Given $\frac{dy}{dx} = -y$ with y (0) = 1. Then using Euler's method, the value of y (0.02) by taking step size h = 0.01, is
***	(1) 3.6845 (2) 2.7862 (3) 0.9801 (4) 0.5401
56.	The Euler's equation corresponding to the functional
	$\int_{0}^{\pi} (y'^{2} - y^{2} + 4y \cos x) dx \text{ subject to } y(0) = 0, y(\pi) = 0 \text{ is}$
83.	(1) $\frac{d^2y}{dx^2} + y = 2 \sin x$ (2) $\frac{d^2y}{dx^2} + y = 2 \cos x$
	(3) $\frac{d^2y}{dx^2} - y = 2 \tan x$ (4) None of these
57.	The extremal of the functional
	$I[y(x)] = \int_{1}^{2} (y'^{2} - 2xy) dx$ subject to $y(1) = 0$, $y(2) = -1$ is
	(1) $y = \frac{1}{6} (x - x^3)$ (2) $y = x^2 - 1$
	(3) $y = \frac{1}{6} (7x - x^3)$ (4) None of these
	(3) 2 None of these and the season of the se

Question	Code
No.	anotisang Questions
58.	The extremal of $\int_{1}^{2} \frac{\dot{x}^{2}}{t^{3}} dt$; $x(1) = 3$, $x(2) = 18$ (where $\dot{x} = \frac{dx}{dt}$) using
	Lagrange's equation is given by which of the following?
	(1) $x = \frac{15^6}{7}t^3 + \frac{6^6}{7}$ (2) $(x) = 5t^2 - 2$ (3) $(x) = 5t^2 - 2$
	(3) $x = 5t^3 + 3$ and add of particle (4) $x = t^4 + 2$ to a value of T 36
59.	The solution of the linear integral equation
	$\phi(x) = (1+x)^2 + \int_{-1}^{1} (x\xi + x^2\xi^2) \phi(\xi) d\xi$, is
	(1) $\phi(x) = 1 + 6x + \frac{25}{9}x^2$ (2) $\phi(x) = 1 - 6x + \frac{5}{9}x^2$
	(3) $\phi(x)=1+3x-\frac{25}{9}x^2$ (4) None of these is more additionally to be sent the edge of the sent that the sent the sent that the sent that the sent the sent that the s
60.	The solution to the integral equation $\phi(x) = x + \int_0^x \sin(x-\xi)\phi(\xi) d\xi$ is given by
	(1) $x^2 + \frac{x^3}{3}$ (2) $x - \frac{x^3}{3!}$
	(3) $x^2 - \frac{x^3}{3!}$ (4) $x + \frac{x^3}{3!}$ (8)

Question No.	anoidean Questions of anoidean A
61.	If 2% of the items manufactured by a factory are defective, then the probability that there are 3 defective items in a sample of 100 items is
boireq i	(1) 0.482 (2) 0.33 (0) (2) (3)
	(3) 0.27 (4) 0.18
62.	For a certain normal distribution, the first moment about 10 is 40 and the fourth moment about 50 is 48. Then the mean and standard deviation of the distribution respectively are
	(1) 20, 3 (2) 30, 4
	(3) 50, 2 (4) None of these
63.	The characteristic function of χ^2 -distribution with n degrees of freedom is
	(1) $(1-2it)^{n/2}$ (2) $(1+2it)^{n/2}$
	(3) $(1-2it)^{-n/2}$ (4) None of these
64.	If Tchebycheff's inequality for a random variable X with mean 12 is
	$P \{6 < X < 18\} \ge \frac{3}{4}$, then the standard deviation of X is
	(1) 2 (2) 3 (5)
oobner (2	(3) 8 None of these
65.	The sum of all the elements of any row of the transition probability matrix of a Markov chain is
	(1) 0 (2) 1
11/201	(3) 2 (4) None of these

Question	anolisas Questions dulisas Questions
No.	
66.	Consider a discrete time Markov chain on the state space {1, 2, 3} with
at amou	$\begin{bmatrix} 0 & 0.2 & 0.8 \end{bmatrix}$
	one-step transition probability matrix $\begin{vmatrix} 0.5 & 0 & 0.5 \end{vmatrix}$. Then the period of
	the Markov el sin :
if boa (a	the Markov chain is
northing	(1) 3 2 San Book Salt Book (2) 2 2 San Book Salt Book (2)
	(3) 1 (4) 0 (4) 0
67.	Let $\{X_t\}$ and $\{Y_t\}$ be two independent pure birth processes with birth rates λ_1 and λ_2 respectively. Let $Z_t = X_t + Y_t$. Then
	(1) $\{Z_t\}$ is not a pure birth process.
12 den 12	(2) $\{Z_i\}$ is a pure birth process with birth rate $\lambda_1 + \lambda_2$.
	(3) $\{Z_t\}$ is a pure birth process with birth rate min (λ_1, λ_2) .
	(4) $\{Z_t\}$ is a pure birth process with birth rate λ_1 λ_2 .
68.	Let X and Y be independent and identically distributed (i.i.d.) random variables uniformly distributed on $(0, 4)$. Then $P(X > Y \mid X < 2 Y)$ is
	(1) 2/3 (2) 5/6
	(3) 1/4 seeds to sook (b) (4) 1/3

Question No.	Questions Polymer Questions			
69.	If X and Y are independent normal variates with zero expectations and variances σ_1^2 and σ_2^2 , then $Z = \frac{XY}{\sqrt{X^2 + Y^2}}$ is normal with variance			
	(1) $\sigma_{z}^{2} = \frac{1}{\left(\frac{1}{\sigma_{1}^{2}} + \frac{1}{\sigma_{2}^{2}}\right)}$ (2) $\sigma_{z}^{2} = \sigma_{1}^{2} + \sigma_{2}^{2}$			
27906	(3) $\sigma_z^2 = \frac{1}{\sigma_1^2} + \frac{1}{\sigma_2^2}$ (4) None of these			
70.	In testing $H: \mu = 100$ against $A: \mu \neq 100$ at the 10% level of significance, H is rejected if			
78,	(1) 100 is contained in the 90% confidence interval			
	(2) The value of the test statistic is in the acceptance region (3) The p-value is less than 0.10			
	(4) The p-value is greater than 0.10			
71.	The non-isomorphic abelian groups of order 20 are $(1) Z_4, Z_2 \times Z_2 \times Z_5 \qquad \qquad (2) Z_8, Z_2 \times Z_5$ $(3) Z_4 \times Z_5, Z_2 \times Z_2 \times Z_5 \qquad \qquad (4) \text{None of these}$			

Question No.	O			
72.	Let Z [x] be the ring of polynomials over the ring of integers. Then			
	(1) the ideal <x> is a prime ideal but not a maximal ideal.</x>			
	(2) the ideal <x> is not a prime ideal but a maximal ideal.</x>			
	(3) the ideal <x> is a prme ideal as well as a maximal ideal.</x>			
	(4) the ideal <x> is neither a prime ideal nor a maximal ideal.</x>			
73.	Which of the following is not a unique factorization domain?			
107	(1) A Euclidean ring. (2) The ring < Z, +, . > of integers.			
OSALSON	(3) $Z[\sqrt{-5}]$ (4) None of these was an analysis of the second state of the second st			
74.	Which one of the following polynomial is irreducible over the field Q rational numbers?			
	(1) $2x^3 + 15x^3 + 3x + 6$ (2) $x^3 + 3x + 1$			
	(3) $8x^3-6x-1$ (4) All of the above			
75.	The degree of splitting field of $x^4 - x^2 - 2$ over the field Q of rations numbers, is			
-	(1) 3 (2) Z ₂ Z ₂ Z ₃ Z ₄ (2) (2) 4 (2) X ₂ Z ₂ Z ₃ Z ₃ Z ₄ (1)			
	(3) 2 Ocean to enach (4) (4) None of these			

Question No.	Wuestions			
76.	Let F be a finite field and let K/F be a field extension of degree 6. Then the Galois group of K/F is isomorphic to			
	(1) the cyclic group of order 6 11 personnes at (2) 1 1 (1)			
	(2) the permutation group on {1, 2, 3}			
	(3) the permutation group on {1, 2, 3, 4, 5, 6}			
	(4) the permutation group on {1}			
77.	Which of the following spaces is not separable? 10 900/4 (b)			
1 34	(1) R with the trivial topology			
	(2) The Cantor set as a subspace of R			
	(3) R with the discrete topology			
	(4) None of these			
78.	Which one of the following topological spaces is not compact?			
	(1) Indiscrete topological space			
	(2) Infinite discrete topological space what magin has IIA (8)			
	(3) A topological space with cofinite topology			
	(4) None of these			
79.	Let X be a topological space and U be a proper dense open subset of X. Then which of the following statement is true?			
	(1) If X is connected, then U is connected.			
	(2) If X is compact, then U is compact.			
	(3) If X\U is compact, then X is compact.			
	(4) If X is compact, then X\U is compact.			

Questic No.	Questions	Co
80.	Let X and Y be two topological spaces and let $f: X \to Y$ be a confunction. Then	nti
	(1) $f^{-1}(K)$ is connected if $K \subset Y$ is connected	1101
	(2) $f^{-1}(K)$ is compact if $K \subset Y$ is compact	
	(3) $f(K)$ is connected if $K \subset X$ is connected	
	(4) None of these are good to the second and the se	
81.	Consider the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$, then	
	(1) A has no real -:	
The state of the s	(2) A has both positive and negative real eigen values. (3) All real eigen values of the second sec	
	(3) All real eigen values of A are positive.(4) All real eigen values of A are negative.	
32.	Which of the following is a linear transformation?	
	(1) $T(x, y) = (1 + x, y)$ for all $(x, y) \in \mathbb{R}^2$.er
- 1	(2) $T(x, y) = (x, x + y)$ for all $(x, y) \in \mathbb{R}^2$	
	$(x, y) - (x^2, y)$ for all $(x, y) \in \mathbb{R}^2$	
	4) None of these dompood IVX med dompood XII (A)	Ut

Question No.	Questions			
83.	The matrix representing the linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ defined by $T(x_1, x_2) = (2x_2, 3x_1 - x_2)$ relative to the basis $\{(1, 3), (2, 5)\}$ is			
	(1) $\begin{bmatrix} 30 & 48 \\ 18 & 29 \end{bmatrix}$ (2) $\begin{bmatrix} -30 & 48 \\ 18 & -29 \end{bmatrix}$			
ble a fa	(3) $\begin{bmatrix} 30 & 48 \\ -18 & -29 \end{bmatrix}$ (4) $\begin{bmatrix} -30 & -48 \\ 18 & 29 \end{bmatrix}$			
84.	Let C³ be a complex inner product space.			
	If the vectors $u_1 = (1, 2i, i)$, $u_2 = (0, 1+i, 1)$, $u_3 = (2, 1-i, i) \in \mathbb{C}^3$, then the vector orthogonal to both u_1 and u_3 is			
moilsmi	(1) $(-3+i,-i,1-5i)$ (2) $(-3+i,-i,1+5i)$			
	(3) (3 · i, -i, 1 + 5i) (4) None of these			
	osed to sool (t) 0 + 1 - 16 + 12 - 1 - 1 9 (6) 3 -3]			
85,	The quadratic form corresponding to symmetric matrix $\begin{bmatrix} 3 & 2 & -4 \\ -3 & -4 & 2 \end{bmatrix}$ is			
	(1) $9x^2 - 2y^2 + 2z^2 - 6xy - 6xz - 8yz$			
	(2) $9x^2 + 2y^2 + 2z^2 + 6xy - 6xz - 8yz$			
	(3) $9x^2 + 2y^2 - 2z^2 + 6xy + 6xz + 8yz$			
	(4) None of these			

Question No.	Code Code
86.	The radius of convergence of the power series $\sum_{n=0}^{\infty} \frac{(n!)^2}{(2n)!} z^n$ is
	(1) 4 (3) 2 (4) None of these
	(4) None of these
87.	Which one of the following functions f (z), of the complex variable z, analytic over the entire complex plane?
	(1) $f(z) = \ln(z)$ (2) $f(z) = e^{1/z}$
dt hads	(3) $f(z) = \frac{1}{1-z}$ (4) $f(z) = \cos z$
88.	If $u = (x - 1)^3 - 3xy^2 + 3y^2$ is the real part of an analytic function $f(z) = u + iv$, then the imaginary part v of $f(z)$ is
Fe-	(1) $3x^2y - 6xy - 3y + y^3 + c$ (2) $3x^2y + 6xy + 3y + y^3 + c$ (3) $3x^2y - 6xy + 3y - y^3 + c$ (4) None of these
89.	
	The value of the integral $\int_C \overline{z} dz$, from $z = 0$ to $z = 4 + 2i$ along the curve given by $z = t^2 + it$, is equal to
	(1) $5 - \frac{8}{3}i$ (2) $10 - \frac{8}{3}i$
	(3) $10 - \frac{4}{3}i$ (4) None of these
	(4) None of these

Question No.	Rapitant Questions Code-B
90.	The value of the integral $\int_C \frac{e^{-z}}{z^2} dz$, where C is a unit circle about the origin, described in positive sense, is equal to (1) 0 (2) π i (3) -2π i (4) None of these
	The infimum and the supremum of the set $\left\{\frac{(-1)^n}{n}: n \in \mathbb{N}\right\}$ are respectively (1) $1, \frac{-1}{2}$ (2) $-1, \frac{1}{2}$ (3) $-1, 0$ (4) None of these
92.	Which of the following sequence is divergent? (1) $a_n = 1 + \frac{2}{n}$ (2) $b_n = \frac{3n-1}{1+2n}$ (3) $c_n = 1 + \frac{(-1)^n}{n}$ (4) $d_n = \sin n$

Set X

Question No.	Questions Code-J
93.	Consider the statements:
NEL TUCK	(a) The series $\frac{1}{3} - \frac{2}{5} + \frac{3}{7} - \frac{4}{9} + \dots$ is convergent.
	(b) The series $1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \dots$ is convergent.
	Then - Month to snow (b)
	(1) Both the statements (a) and (b) are true
spective	(2) The statement (a) is true and (b) is false
	(3) The statement (a) is false and (b) is true
	(4) Neither (a) nor (b) is true
94.	Every bounded sequence has at least one limit point. This represents
	(1) Archimedean Property (2) Heine-Borel theorem
	(3) Bolzano-Weierstress theorem (4) Denseness Property
95.	Let $f:[0, \infty) \to R$ be a function, where R denotes the set of all real numbers. Then which one of the following statements is true?
	(1) If f is continuous and $\lim_{x\to\infty} f(x)$ is finite, then f is uniformly continuous.
	(2) If f is bounded and continuous, then f is uniformly continuous.
	(3) If f is uniformly continuous, then $\lim_{x\to\infty} f(x)$ exists.
	(4) None of these

Question No.	another Questions noite by
96.	Which of the following is false?
	(1) The sequence $\{f_n\}$, where $f_n(x) = \frac{1}{x+n}$, is uniformly convergent in any interval $[0, b]$, $b > 0$.
	(2) The sequence $\{f_n\}$, where $f_n(x) = \frac{n^2x}{1+n^3x^2}$, is uniformly convergent on the interval $[0, 1]$.
959 1.16	(3) The sequence $\{f_n\}$, where $f_n(x) = \tan^{-1} nx$, $x \ge 0$, is uniformly convergent in any interval $[a, b]$, $a > 0$.
	(4) None of these
97.	For which of the following function, Rolle's theorem is not applicable?
	(1) $f(x) = \cos 2x \text{ in } [-\pi/4, \pi/4]$ (2) $f(x) = \frac{\sin x}{e^x} \text{ in } [0, \pi]$
	(3) $f(x) = x^3 - 6x^2 + 11x - 6 in [1,3]$ (4) $f(x) = x in [-1, 1]$
98.	If f (x) = x, x \in [0, 1] and let P = $\left\{0, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1\right\}$ be the partition of [0, 1], then U (f, P) is
	(1) 23/36 (2) 31/36
	(3) 49/36 (4) None of these

Question No.	Questions Code-
99.	If a function f defined on [0, 1] as $f(x) = \begin{cases} \sin(\frac{1}{x}), & \text{if } x \text{ is irrational} \\ 0, & \text{otherwise} \end{cases}$, then
	(1) f is not bounded 0 < d to 0 lavistary 1 1 1 1
gent of	(2) f is R-integrable
	(3) f is not R-integrable since f is not bounded
overgen	(4) f is not R-integrable since lower and upper integrals of f are unequal
100.	Consider the following improper integrals
	$I_1 = \int_0^\infty \frac{\sin^2 x}{x^2} dx \text{ and } I_2 = \int_1^\infty \frac{x^3}{(1+x)^5} dx \text{ , then}$
	(1) Both are divergent (2) I ₁ converges but not I ₂
	(3) I ₂ converges but not I ₁ (4) Both are convergent
Of to lo	Bartin and Alander Park Hand Lee Park Programme the partition
	(b) If it bounded and construction of (I it) If each
	DEVIS (C)
	(8) M. In the Marian by Continuous, then has a far and the second to should be a fallower of the second by the sec
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SET-"X"

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(Total No. of printed pages: 29)

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10063

Code

MATHEMATICS

(Signature of the candidate)

(Signature of the Invigilator)

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

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2. The candidates must return the Question book-let 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 and D code will be uploaded on the university website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.

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MUST NOT be ticked in the Question book-let.

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.

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Sheet.

8. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

Set-X Code-C
anoitse Questions V to moiteauQ
The non-isomorphic abelian groups of order 20 are $(1) Z_4, Z_2 \times Z_2 \times Z_5 \qquad \qquad (2) Z_8, Z_2 \times Z_5 \qquad \qquad (3) Z_4 \times Z_5, Z_2 \times Z_2 \times Z_5 \qquad \qquad (4) \text{None of these}$
Let Z [x] be the ring of polynomials over the ring of integers. Then (1) the ideal <x> is a prime ideal but not a maximal ideal. (2) the ideal <x> is not a prime ideal but a maximal ideal. (3) the ideal <x> is a prime ideal as well as a maximal ideal. (4) the ideal <x> is neither a prime ideal nor a maximal ideal.</x></x></x></x>
Which of the following is not a unique factorization domain? (1) A Euclidean ring. (2) The ring $<$ Z, $+$, $.>$ of integers. (3) Z [$\sqrt{-5}$] (4) None of these
Which one of the following polynomial is irreducible over the field Q of rational numbers? (1) $2x^5 + 15x^3 + 3x + 6$ (2) $x^3 + 3x + 1$
(3) $8x^3 - 6x - 1$ (4) All of the above The degree of splitting field of $x^4 - x^2 - 2$ over the field Q of rational numbers, is (1) 3 (2) 4 (3) 2 (4) None of these

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Question	Questions
No.	Cald extension of degree 6. Then
6.	Let F be a finite field and let K/F be a field extension of degree 6. Then the Galois group of K/F is isomorphic to
	(1) the cyclic group of order 6
	(2) the permutation group on {1, 2, 3}
n n	(2) the permutation group on {1, 2, 3, 4, 5, 6} (3) the permutation group on {1, 2, 3, 4, 5, 6}
	(4) the permutation group on {1}
7.	Which of the following spaces is not separable?
	(1) R with the trivial topology and analysis as head (6)
	(2) The Cantor set as a subspace of R
	(3) R with the discrete topology
	(4) None of these
8.	Which one of the following topological spaces is not compact?
	(1) Indiscrete topological space
1	(2) Infinite discrete topological space
	(3) A topological space with cofinite topology
	(4) None of these (5)
9.	Let X be a topological space and U be a proper dense open subset of Y Then which of the following statement is true?
famil	(1) If X is connected, then U is connected.
	(2) If X is compact, then U is compact.
	(3) If X\U is compact, then X is compact.
	(4) If X is compact, then X\U is compact.

uestion No.	anoliza Questions	Question
10.	Let X and Y be two topological spaces and let $f: X \to Y$ be a confunction. Then	tinuous
	(1) $f^{-1}(K)$ is connected if $K \subset Y$ is connected	
	(2) $f^{-1}(K)$ is compact if $K \subset Y$ is compact	1 the
	(3) $f(K)$ is connected if $K \subset X$ is connected	nontin
38.	(4) None of these Oberg toubord term xelquion and to tell	14.
11.	Consider the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$, then	es es
-37 -4 ±	(1) A has no real eigen values. (2) A has both positive and negative real eigen values.	15.
	(3) All real eigen values of A are positive.	
	(4) All real eigen values of A are negative.	
12.	Which of the following is a linear transformation?	
20.	(1) $T(x, y) = (1 + x, y)$ for all $(x, y) \in \mathbb{R}^2$	dident (
	(2) $T(x, y) = (x, x + y)$ for all $(x, y) \in \mathbb{R}^2$	
2	(3) $T(x, y) = (x^2, y)$ for all $(x, y) \in \mathbb{R}^2$	
	(4) None of these	

Code-C

Question No.	Questions notice Questions
13.	The matrix representing the linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ defined by $T(x_1, x_2) = (2x_2, 3x_1 - x_2)$ relative to the basis $\{(1, 3), (2, 5)\}$ is
	(1) $\begin{bmatrix} 30 & 48 \\ 18 & 29 \end{bmatrix}$ (2) $\begin{bmatrix} -30 & 48 \\ 18 & -29 \end{bmatrix}$ (2)
(8)	(3) $\begin{bmatrix} 30 & 48 \\ -18 & -29 \end{bmatrix}$ (4) $\begin{bmatrix} -30 & -48 \\ 18 & 29 \end{bmatrix}$ (8)
14.	Let C ³ be a complex inner product space.
	If the vectors $\mathbf{u}_1=(1,2\mathbf{i},\mathbf{i}),\mathbf{u}_2=(0,1+\mathbf{i},1),\mathbf{u}_3=(2,1-\mathbf{i},\mathbf{i})\in \mathbf{C}^3$, then the vector orthogonal to both \mathbf{u}_1 and \mathbf{u}_3 is
1.0	(1) $(-3+i, -i, 1-5i)$ (2) $(-3+i, -i, 1+5i)$
	(3) $(3+i, -i, 1+5i)$ (4) None of these
1 10	[7. 8 (1) Pas no real sigen values.
15.	The quadratic form corresponding to symmetric matrix $\begin{bmatrix} 3 & 2 & -4 \\ -3 & -4 & 2 \end{bmatrix}$ is
	(1) $9x^2 - 2y^2 + 2z^2 - 6xy - 6xz - 8yz$
	(2) $9v^2 + 2v^2 + 2z^2 + 6vx$ $6vz + 8vz$
G	(3) $9x^2 + 2y^2 - 2z^2 + 6xy + 6xz + 8yz$
	(4) None of these
16.	The radius of convergence of the power series $\sum_{n=0}^{\infty} \frac{(n!)^2}{(2n)!} z^n$ is
-	(1) 4 company than $2\eta = (y, x)$ (2), $3\eta = (y, x)$ (1)
	(3) 2 (4) None of these

Set-X Code-C

Question No.	Buoides Questions Pagister 40
17.	Which one of the following functions f (z), of the complex variable z, is analytic over the entire complex plane?
	(1) $f(z) = \ln(z)$ (2) $f(z) = e^{1/z}$
	(3) $f(z) = \frac{1}{1-z}$ (4) $f(z) = \cos z$
18.	If $u = (x - 1)^3 - 3xy^2 + 3y^2$ is the real part of an analytic function $f(z) = u + iv$, then the imaginary part v of $f(z)$ is
10.	(1) $3x^2y - 6xy - 3y + y^3 + c$ (2) $3x^2y + 6xy + 3y + y^3 + c$
	(3) $3x^2y - 6xy + 3y - y^3 + c$ (4) None of these
19.	The value of the integral $\int \overline{z} dz$, from $z = 0$ to $z = 4 + 2i$ along the curve C
	given by $z = t^2 + it$, is equal to
\(\frac{1}{2}\)	(1) $5 - \frac{8}{3}i$ (2) $10 - \frac{8}{3}i$ 1 settee sdT (d)
	(3) $10-\frac{4}{3}i$ (4) None of these (8)
20.	The value of the integral $\int_{C}^{C} \frac{e^{-z}}{z^2} dz$, where C is a unit circle about the
Side	origin, described in positive sense, is equal to
	(2) π i π (2) π i π (1)
The State of	(3) $-2\pi i$ (4) None of these

Question No.	Questions quitable Questions
21.	The infimum and the supremum of the set $\left\{\frac{(-1)^n}{n}: n \in \mathbb{N}\right\}$ are respectively
	(1) $1, \frac{-1}{2}$ (2) $-1, \frac{1}{2}$
	(3) -1, 0 (4) None of these
22.	Which of the following sequence is divergent?
74	(1) $a_n = 1 + \frac{2}{n}$ (2) $b_n = \frac{3n-1}{1+2n}$
	(3) $c_n = 1 + \frac{(-1)^n}{n}$ (4) $d_n = \sin n$
23.	Consider the statements:
16.	(a) The series $\frac{1}{3} - \frac{2}{5} + \frac{3}{7} - \frac{4}{9} + \dots$ is convergent.
	(b) The series $1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \dots$ is convergent.
	Then
	(1) Both the statements (a) and (b) are true(2) The statement (a) is true and (b) is false
	(3) The statement (a) is false and (b) is true
dt toods	(4) Neither (a) nor (b) is true
24.	Every bounded sequence has at least one limit point. This represents
	(1) Archimedean Property (2) Heine-Borel theorem
	(3) Bolzano-Weierstress theorem (4) Denseness Property

Question No.	Questions Actions						
25.	Let $f:[0,\infty)\to R$ be a function, where R denotes the set of all real numbers. Then which one of the following statements is true?						
	(1) If f is continuous and $\lim_{x\to\infty} f(x)$ is finite, then f is uniformly continuous.						
	(2) If f is bounded and continuous, then f is uniformly continuous.						
	(3) If f is uniformly continuous, then $\lim_{x\to\infty} f(x)$ exists.						
inen.	(4) None of these						
26.	Which of the following is false?						
	(1) The sequence $\{f_n\}$, where $f_n(x) = \frac{1}{x+n}$, is uniformly convergent in						
ore 1 h	any interval [0, b], b > 0. and addressed R period lawyers						
	(2) The sequence $\{f_n\}$, where $f_n(x) = \frac{n^2x}{1+n^3x^2}$, is uniformly convergent on the interval $[0, 1]$.						
	(3) The sequence $\{f_n\}$, where $f_n(x) = \tan^{-1} nx$, $x \ge 0$, is uniformly convergent in any interval $[a, b]$, $a > 0$.						
	(4) None of these attent (b) Than the sequence 1 (8)						
27.	For which of the following function, Rolle's theorem is not applicable?						
l og vi lo	(1) $f(x) = \cos 2x \text{ in } [-\pi/4, \pi/4]$ (2) $f(x) = \frac{\sin x}{e^x} \text{ in } [0, \pi]$						
	(3) $f(x) = x^3 - 6x^2 + 11x - 6 \text{ in } [1,3]$ (4) $f(x) = x \text{ in } [-1,1]$						

Sol-X

Question No.	anette Questions Inoltae
28.	If f (x) = x, x ∈ [0, 1] and let P = $\left\{0, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1\right\}$ be the partition of [0, 1], then U (f, P) is
	(1) 20/00
	(3) 49/36 None of these of all 1/4/49
29.	If a function f defined on [0, 1] as $f(x) = \begin{cases} \sin(\frac{1}{x}), & \text{if } x \text{ is irrational} \\ 0, & \text{otherwise} \end{cases}$, then
	(1) f is not bounded Tealer at natwolfer and to do will as
	(2) f is R-integrable
or treat	(3) f is not R-integrable since f is not bounded
	(4) f is not R-integrable since lower and upper integrals of f are unequal
30.	Consider the following improper integrals
hoytov	$I_1 = \int_0^\infty \frac{\sin^2 x}{x^2} dx \text{ and } I_2 = \int_1^\infty \frac{x^3}{(1+x)^5} dx$, then
	(1) Both are divergent (2) I ₁ converges but not I ₂
	(3) I ₂ converges but not I ₁ (4) Both are convergent
31.	Let p be the probability that a coin will fall head in a single toss in order to test $H_0 = p = \frac{1}{2}$ against $H_1 : p = \frac{3}{4}$. The coin is tossed 5 times and H_0 is
***	rejected if more than 3 heads are obtained. Then the probability of type I error is
	(1) 1/16 (2) 3/16
	(3) 5/16 (4) None of these

Question No.	QUESTIONS						
32.	Given the observations 0.8, 0.71, 0.9, 1. uniform distribution on $(\theta - 0.2, \theta + 0.8)$ following is a maximum likelihood estim) with $-\infty < \theta < \infty$, which of the					
	(1) 0.7 (2) 0.9	og at the beath will find to wait.					
	(3) 1.1 (4) 1.3	att Lipan					
33.	If X ₁ , X ₂ , X ₃ ,, X _n is a random sam	aple from a normal population					
	N (μ , 1). Then $t = \frac{1}{n} \sum_{i=1}^{n} X_i^2$ is a unbiased						
	(1) μ^2 00 94 10 980/4 (b) (2) μ^2	-1					
	(3) $1 - \mu^2$ (4) μ^2						
34.	Let X_1, X_2, \ldots, X_n be a random sample of distribution with mean μ and positive Choose the correct statement	and the state of t					
	(1) $(X_1 - \mu)' \sum_{1}^{-1} (X_1 - \mu)$ has chi-square	distribution with 1 d.f.					
	(2) $\overline{X} \overline{X}'$ has Wishart distribution with						
r k _i and process at. The	(3) $\sum_{i=1}^{n} (X_i - \mu)(X_i - \mu)' \text{ has Wishart dist}$						
	(4) $X_1 + X_2$ and $X_1 - X_2$ are independen						
35.	In a trivariate distribution : $\sigma_1 = 2$, $\sigma_2 = 2$. Then $R_{1.23}$ is	$= \sigma_3 = 3$, $r_{12} = 0.7$, $r_{23} = r_{31} = 0.5$					
	(1) 0.1423 (2) 0.7	7211					

Question No.	Questions					
1000		No				
36,	The total number of all possible Latin squares of order 3 is	92.				
	(1) 12 Ye rol etermine box (2) 9 musticam a si garwollo					
	(3) 6 (4) None of these					
37.	The Mean time to failure (MTTF) for an exponential distribution parameter λ is					
	(1) λ 10 to the malities beautiful (2) λ ²					
	(3) 1/\lambda (4) None of these					
38.	The maximum value of $Z = 2x + 3y$	1000				
e Nozana Weist 7	subject to the constraints:					
	$x + y \le 30$; $3 \le y \le 12$; $x - y \ge 0$; $0 \le x \le 20$, is					
10.	(1) 72					
and the	(2) 60 (3) 49 (4) None of these					
V	Men arrive in a queue according to a Poisson process with rate vomen arrive in the same queue according to another Poisson with rate λ_2 . The arrivals of men and women are independent robability that the first arrival in the queue is a man is	λ_1 and process at. The				
	$\frac{\lambda_1}{\lambda_1 + \lambda_2} \qquad (2) \frac{\lambda_2}{\lambda_1 + \lambda_2}$	# (00 to 1)				
(3) $\frac{\lambda_1}{\lambda_2}$ send to anoth (a) (4) $\frac{\lambda_2}{\lambda_1}$ (6)	ftyps I				
	19) None of these					

Question No.	Amouta Questions					
40.	Arrivals at a telephone booth are considered to be Poisson with an average time of 12 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 4 minutes. Then the probability that a person arriving at the booth will have to wait in the queue is					
	(1) $\frac{2}{3}$ (2) $\frac{1}{3}$ (3) I be solve and along this print are a negative grain.					
	(3) $\frac{1}{6}$ (4) None of these					
41.	Using Newton Raphson's method, the smallest positive root of the equation $3x^3 - 9x^2 + 8 = 0$, lying between 1 and 2, is					
alue of	(1) 1.0327 (2) 1.2261 (3) 1.6514 (4) None of these					
42.	Using Gauss Elimination method, the solution of following equations					
	4x + 3y + 2z = 8, $x + y + 2z = 7$, $3x + 2y + 4z = 13$ is given by					
	(1) $x = -1$, $y = 2$, $z = 3$ (2) $x = 1$, $y = 2$, $z = 3$ (3) $x = -1$, $y = -2$, $z = 3$ (4) $x = 1$, $y = -2$, $z = 3$					
43.	Given that					
	x 3 7 9 10 f(x) 168 120 72 63					
	The value of third divided difference of the function f (x) is (1) 5 (2) 1					
	(3) -1 $(4) -2$					

Question No.				anoli	Quest	ions				001389 No.	
44.	Consid	ler the	data giv	en belo	w:	Liber Sun Libera dell	pdqalaj astotili	ata ata of 12 a	nad pm)	.01	
tiew of	X	0	1	2	3	4	5	6	7	8	-1
	f(x)	0	4.13	7.20	9.25	10.25	10.00	9.05	7.12	6.2	
11.	40 A		on's one		(8)		$\int_{0}^{8} f(x) dx$	dx is	(3)		
	(1) 3	4.5			(2)	47.3	of these				
gottauj	(3) 5	2.8	ast positi		(4)	60.4		Newto	Using		4
45.	y (0.02 (1) 3	2) by ta .6845	y with king ster	size h	= 0.01,	is 2.7862	nimital	(.651.4 g Gauss ly + 2z		alue o	
46.	$\int_{0}^{\pi} (y'^{2} -$	$-y^2+4$	quation y cos x) da	subje	ect to y	(0) = 0, y	$y(\pi)=0$	is	(I) (ii)	A no	100 m 100
			= 2 sin x								
	(o)	lx ²	2 (411)	2	(4) (4)	rone	or these	1	(1)		

Question No.	anoting Questions
47.	The extremal of the functional $I[y(x)] = \int_{1}^{2} (y'^{2} - 2xy) dx \text{subject to } y(1) = 0, y(2) = -1 \text{ is }$
	(1) $y = \frac{1}{6} (x - x^3)$ (2) $y = x^2 - 1$ (2)
	(3) $y = \frac{1}{6} (7x - x^3)$ (4) None of these
48.	The extremal of $\int_{1}^{2} \frac{\dot{x}^{2}}{t^{3}} dt$; $x(1) = 3$, $x(2) = 18$ (where $\dot{x} = \frac{dx}{dt}$) using Lagrange's equation is given by which of the following?
	(1) $x = \frac{15}{7}t^3 + \frac{6}{7}$ (2) $x = 5t^2 - 2$
40	(3) $x = 5t^3 + 3$ (4) $x = t^4 + 2$
49.	The solution of the linear integral equation $\phi(x) = (1+x)^2 + \int_{-1}^{1} (x\xi + x^2\xi^2) \phi(\xi) d\xi, \text{ is a subsequential equation}$
	(1) $\phi(x) = 1 + 6x + \frac{25}{9}x^2$ (2) $\phi(x) = 1 - 6x + \frac{5}{9}x^2$
	(3) $\phi(x) = 1 + 3x - \frac{25}{9}x^2$ (4) None of these

Question No.	Questions
50.	The solution to the integral equation $\phi(x) = x + \int_{0}^{x} \sin(x-\xi)\phi(\xi) d\xi$ is
	given by (-= (2) v .0 = (1) v at residue 2b (ccc - v) = (x) v [1] 1 (x)
	(1) $x^2 + \frac{x^3}{3}$ (2) $x - \frac{x^3}{3!}$ (2) $(x - x)^{\frac{1}{3!}}$
	(1) $x^2 + \frac{x^3}{3}$ (2) $x - \frac{x^3}{3!}$ (3) $x^2 - \frac{x^3}{3!}$ (4) $x + \frac{x^3}{3!}$ (5)
51.	The Laurent series expansion of $f(z) = \frac{z}{(z-1)(z-3)}$ for $0 < z-1 < 2$, is equal to
	(1) $\frac{-3}{4} \sum_{n=0}^{\infty} \frac{(z-1)^n}{2^n} - \frac{1}{2(z-1)}$ (2) $\frac{3}{4} \sum_{n=0}^{\infty} \frac{(z-1)^n}{2^n} - \frac{1}{4(z-1)}$
	(3) $\frac{1}{4} \sum_{n=0}^{\infty} \frac{(z-1)^{-n}}{2^n} + \frac{(z-1)}{2}$ (4) None of these
52.	The residue of the function $f(z) = \frac{1}{(z^2+1)^3}$ at $z = i$, is
	(1) $\frac{3}{16i}$ (2) $\frac{3}{2i}$ (2) $\frac{3}{2i}$ (1)
	(3) $\frac{4}{3i}$ (4) None of these

Question No.	Questions Questions
53.	The fixed points of the Mobius transformation $w = \frac{(2+i)z-2}{z+i}$ are
	(1) 1, -1 (2) 0, 1
noites	(3) -1, 1 (4) 1+i, 1-i
54.	The image of circle $ z-2 = 2$ under the Mobius transformation $w = \frac{z}{z+1}$
	is a circle in w-plane with
	(1) Centre $\left(\frac{1}{5}, 0\right)$ and radius $\frac{2}{5}$ (2) Centre $\left(\frac{2}{5}, 0\right)$ and radius $\frac{1}{5}$
	(3) Centre $\left(\frac{1}{5},0\right)$ and radius $\frac{1}{5}$ (4) Centre $\left(\frac{2}{5},0\right)$ and radius $\frac{2}{5}$
55.	If 9 colours are used to paint 100 houses, then atleast houses will be of the same colour.
	(1) 18 (2) 15 more group a ad D tall (0)
	(3) 12
56.	The congruence $35x \equiv 14 \pmod{21}$ has
	(1) 5 solutions (2) 6 solutions (8)
	(3) 7 solutions (4) No solution (4)

Question No.	Anolite Questions anolites
57.	The primitive roots of 32 are
	(1) 3, 7 (2) 2, 5
	(3) 5, 7 (4) None of these
58.	Let G = {0, 1, 2, 3, 4, 5, 6, 7} be a group under the binary operation 'addition modulo 8', then the order of element 5, is
	(1) 1 (2) 2 ditiw enalgewini elorio a si
gr.	(3) 4 0 5 50 100 (2) (4) 8 (5) 50 100 (2) (2) (4) 8 (5) 50 100 (2) (5) 50 100 (2) (6)
59.	The centre of a non-abelian group of order 343 always haselement in its centre.
	(1) 3 (2) 7
Bosnod	(3) 5 (4) None of these studios C M
60.	Let G be a group of order 20449. Then
	(1) G has only one Sylow-11 subgroup
	(2) G has only two Sylow-11 subgroups and the subgroups are subgroups.
	(3) G has only four Sylow-11 subgroups

Question No.	Tamohao Questions The Martin St. Comments of the Comments of t
61. disc	The resolvent kernel for the integral equation $\phi(x) = 29 + 6x + \int_{0}^{x} [5 - 6(x - \xi)] \phi(\xi) d\xi, \text{ is}$
	(1) $9 e^{3(x-\xi)} - 4 e^{2(x-\xi)}$ (2) $9 e^{2(x-\xi)} - 4 e^{3(x-\xi)}$
	(3) $9 e^{3(x-\xi)} - e^{-2(x-\xi)}$ (4) None of these
62.	Consider the two dimensional metion of a mass m attached to one end of a spring whose other end is fixed. Let k be the spring constant. The kinetic energy T and the potential energy V of the system are given by
	$T = \frac{1}{2} m (\dot{r}^2 + (r\dot{\theta})^2)$ and $V = \frac{1}{2} k r^2$,
bazil p	es. It I = IL. L. L. is the vector moment of the external forces about
- tentour	where $\dot{r} = \frac{dr}{dt}$ and $\dot{\theta} = \frac{d\theta}{dt}$ with t as time.
B) 0, 0,	Then which of the following statement is correct?
	(1) r is an ignorable coordinate
B) (0, 0)	(2) θ is not an ignorable coordinate (0 – 0 – 0 A – 1 (2)
*	(3) r² θ remains constant throughout the motion
e a ta	(4) r θ remains constant throughout the motion
63.	The Lagrange's equation for a simple pendulum is, (where symbols have their usual meanings)
edi nen	66. An integer is chosen at random from two hundred digits. T probability that the integer is divisible is divisible by 6 or 8 is
	(1) $\dot{\theta} + \frac{g}{4}\sin\theta = 0$ (2) $\ddot{\theta} + \frac{g}{4}\sin\theta = 0$
	(2) 1/4 (2) (2) (2) (3) (4)
	(3) $\ddot{\theta} + \frac{g}{\ell} \tan \theta = 0$ (4) None of these (8)

Question No.	anoise Questions				
64.	Let q_i and \dot{q}_i respectively are the generalized coordinates and velocity of a mechanical system and p_i are its generalized momenta. If H is the Hamiltonian of the system, then Hamilton's equations of motion are				
x	(1) $\dot{q}_i = \frac{\partial H}{\partial p_i}, \dot{p}_i = \frac{\partial H}{\partial q_i}$ (2) $\dot{q}_i = -\frac{\partial H}{\partial p_i}, \dot{p}_i = \frac{\partial H}{\partial q_i}$				
	(3) $\dot{q}_i = \frac{\partial H}{\partial p_i}, \dot{p}_i = -\frac{\partial H}{\partial q_i}$ (4) $\dot{q}_i = -\frac{\partial H}{\partial p_i}, \dot{p}_i = -\frac{\partial H}{\partial q_i}$				
65.	If $L = [L_1, L_2, L_3]$ is the vector moment of the external forces about a fixed point O , $\omega = [\omega_1, \omega_2, \omega_3]$ the angular velocity, and A , B , C are the principal moments of inertia, then Euler's dynamical equations of motion are				
	(1) $L_1 = A\omega_1 - (B - C)\omega_2\omega_3$, $L_2 = B\omega_2 - (C - A)\omega_3\omega_1$, $L_3 = C\omega_3 - (A - B)\omega_1\omega_2$ (2) $L_1 = A\dot{\omega}_1 - (B - C)\omega_2\omega_3$, $L_2 = B\dot{\omega}_2 - (C - A)\omega_3\omega_1$, $L_3 = C\dot{\omega}_3 - (A - B)\omega_1\omega_2$				
	(3) $L_1 = A\dot{\omega}_1 + (B - C)\omega_2\omega_3$, $L_2 = B\dot{\omega}_2 + (C - A)\omega_3\omega_1$, $L_3 = C\dot{\omega}_3 + (A - B)\omega_1\omega_2$				
gvari sli	(4) None of these (6) None of these (6) None of these (6) None of these (6) None of these				
66.	An integer is chosen at random from two hundred digits. Then the probability that the integer is divisible is divisible by 6 or 8 is (1) 3/4 (2) 1/2				
	(3) 3/8 seed to enov (a) (4) 1/4 0 = 0 ns 3 + 8 (8)				

Question No.	enotine Questions de notation			
67.	In a bolts factory, machines I, II and III manufacture respectively 25%, 35% and 40% of the total bolts. Of their total output 5%, 4% and 2% are respectively defective bolts. A bolt is drawn at random from the product. If the bolt drawn is found to be defective, what is the probability that it is manufactured by machine II?			
	(1) 0.41 (2) 0.27			
	(3) 0.13 (4) None of these			
68.	Let X be a continuous random variable with probability density function (p.d.f.) defined as $f(x) = 6x(1-x)$, $0 \le x \le 1$.			
	Then the value of number b such that $P(X < b) = P(X > b)$ is			
ens ne	(1) 1/4 elquise in a manufactured by a factory are defective. (1) 1/4 elquise in a manufacture (2) 3/4 elquise in a manufacture (2) 1/4 elquise in a manufacture (2) 1/4 elquise in a manufacture (3)			
	(3) 1/2 (4) None of these (5) (2) (4) None of these (6) (7) (6)			
69.	If X and Y are two random variables having joint density function given by			
77.	$f(x, y) = \begin{cases} 6x^2y ; 0 < x < 1, 0 < y < 1 \\ 0, \dots, \text{ otherwise} \end{cases}$ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $ $6x^2y ; 0 < x < 1, 0 < y < 1 $			
Biobasi	Then P (X + Y < 1) is The distribution of A to notional billion and a second and the second and			
	(1) 1/4 (2) (2) 1/10 (3) (1)			
	(3) 3/8 (4) None of these (6)			

Question No.	Questions Questions	uestagi No.
70.	For $k = 1, 2,, 10$, let the probability density function of the ravariable X_k is given by	ndom
ei ii in	$f_{x_k}(x) = \begin{cases} \frac{e^{-\frac{x}{k}}}{k}, & x > 0 \\ 0, & \text{otherwise (2)} \end{cases}$ Herein a large strong	ATE .
	(0 , otherwise (2)	
	Then the value of $E\left(\sum_{k=1}^{10} k X_k\right)$ is equal to	
doitean	(1) 385 (2) 256 (x) 1 as bendeb (1 b.g)	.88
1 65.	(3) 144 (4) 110	
71.	If 2% of the items manufactured by a factory are defective, the probability that there are 3 defective items in a sample of 100 item	n the
	(1) 0.48 (3) 0.27 (2) 0.33 (4) 0.18	
	(3) 0.27 (4) 0.18	
72.	For a certain normal distribution, the first moment about 10 is 40 ar fourth moment about 50 is 48. Then the mean and standard deviate the distribution respectively are	nd the
	(1) 20, 3	
00.	(3) 50, 2 (4) None of these	
73.	The characteristic function of χ^2 -distribution with n degrees of free is	edom
	(1) $(1-2it)^{n/2}$ OUV (2) $(1+2it)^{n/2}$ AU (1)	
	(3) $(1-2it)^{-n/2}$ (4) None of these 8/8 (8)	

Code-C

Question	Questions	Code-(
No.		There's
74.	If Tchebycheff's inequality for a random variable X with	mean 12 i
	$P\{6 < X < 18\} \ge \frac{3}{4}$, then the standard deviation of X is	inav t w
	23 66 (2) 66 (1)	(b) J-0
	(1) 2 (2) 3 (3) 8 (4) None of these	(E). (3)
75.	The sum of all the elements of any row of the transition probal of a Markov chain is	oility matri
	(1) 0 (2) 1 confirm to boundary and the	
	(3) 2 (4) None of these	
76.	Consider a discrete time Markov chain on the state space {	1. 2. 3} wit
63.	one-step transition probability matrix $\begin{bmatrix} 0 & 0.2 & 0.8 \\ 0.5 & 0 & 0.5 \\ 0.6 & 0.4 & 0 \end{bmatrix}$. Then to	
	the Markov chain is	
ti shri	(1) 3 (2) 2 (2) 2 (3) 4 (4) 1 (4) 1 (4) (4) (4) (4) (4) (4) (4) (4) (4) (4)	
	(3) 1 (4) 0 (4) $0 = \mu$ H gailes.	
77.	Let $\{X_t\}$ and $\{Y_t\}$ be two independent pure birth processes with λ_1 and λ_2 respectively. Let $Z_t = X_t + Y_t$. Then	birth rate
840	(1) {Z _t } is not a pure birth process.	(2)
	(2) $\{Z_t\}$ is a pure birth process with birth rate $\lambda_1 + \lambda_2$.	(8)
	(3) $\{Z_t\}$ is a pure birth process with birth rate min (λ_1, λ_2) .	(B)
	(4) $\{Z_t\}$ is a pure birth process with birth rate $\lambda_1 \lambda_2$.	tracent i

Question No.	Questions			
78.	Let X and Y be independent and identically distributed (i.i.d.) ravariables uniformly distributed on (0, 4). Then P (X > Y X < 2 Y)			
	(1) 2/3 (2) 5/6			
	(3) 1/4 (4) 1/3			
79.	If X and Y are independent normal variates with zero expectations a			
	variances σ_1^2 and σ_2^2 , then $Z = \frac{XY}{\sqrt{X^2 + Y^2}}$ is normal with variance			
	(1) $\sigma_z^2 = \frac{1}{\left(\frac{1}{\sigma_1^2} + \frac{1}{\sigma_2^2}\right)}$ (2) $\sigma_z^2 = \sigma_1^2 + \sigma_2^2$			
	(3) $\sigma_z^2 = \frac{1}{\sigma_1^2} + \frac{1}{\sigma_2^2}$ (4) None of these			
80.	In testing $H: \mu = 100$ against $A: \mu \neq 100$ at the 10% level of significance, is rejected if			
in rate	(1) 100 is contained in the 90% confidence interval			
	(2) The value of the test statistic is in the acceptance region			
	(3) The p-value is less than 0.10 around daily and and a sign (3)			
5.	(4) The p-value is greater than 0.10 me than a mag as a lay			
	(4) (Z) is a pure birth process with birth rate A X 2 2 2 - 1)			

Question No.	Questions Questions	Code-(
EANET		No.
81.	Which of the following functions is not a function of bounded	variation?
	(1) $f(x) = \begin{cases} x \sin(\pi/x), & \text{if } 0 < x \le 1 \\ 0, & \text{if } x = 0 \end{cases}$ (2) $f(x) = \begin{cases} x^2 \sin(1/x) \\ 0, & \text{if } x = 0 \end{cases}$), if $x \neq 0$, if $x = 0$
	(3) $f(x) = 3x^2 - 2x^3, -2 \le x \le 2$ (4) None of these	(1) \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
82.	Choose the incorrect statement.	(0)
	(1) The set of all irrational numbers in [0, 1] is measurable.	(8)
	(2) Every non-empty one set has positive measure.	
	(3) Every subset of a set of measure zero is not of measure z	
B Son a	(4) None of these	art 1 + 198
83.	The directional derivative of the function $\phi(x, y) = \frac{xy}{x^2 + y^2}$ a	1)
1973	(0.1) along a line melting on and coop :: 1	t the poin
A . L	(0, 1) along a line making an angle of 30° with positive direction	of x-axis is
	(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{\sqrt{3}}{2}$ (3) $\frac{\sqrt{3}}{2}$ (4) $\frac{\sqrt{3}}{2}$ (5) $\frac{\sqrt{3}}{2}$ (6) $\frac{\sqrt{3}}{2}$ (7) $\frac{\sqrt{3}}{2}$ (8) $\frac{\sqrt{3}}{2}$ (9) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (2) $\frac{\sqrt{3}}{2}$ (3) $\frac{\sqrt{3}}{2}$ (4) $\frac{\sqrt{3}}{2}$ (5) $\frac{\sqrt{3}}{2}$ (7) $\frac{\sqrt{3}}{2}$ (8) $\frac{\sqrt{3}}{2}$ (9) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (1) $\frac{\sqrt{3}}{2}$ (2) $\frac{\sqrt{3}}{2}$ (3) $\frac{\sqrt{3}}{2}$ (4) $\frac{\sqrt{3}}{2}$ (5) $\frac{\sqrt{3}}{2}$ (7) $\frac{\sqrt{3}}{2}$ (8) $\frac{\sqrt{3}}{2}$ (9) $\frac{\sqrt{3}}{2}$ (1)	
bsa _{e-10}	(3) $\sqrt{3}$ (4) None of these	
84.	The metric space (R, d), where d is a usual metric, is	15
	(1) compact (2) disconnected	ship union
	(3) connected but not compact (4) compact and conn	entod

Question No.	Questions	".old
85.	In a metric space (0, 1] with usual metric d (x, y) = $ x - y $, the sequence $(\frac{1}{n})$ is a	uenc
	(1) Not a Cauchy sequence	
74.	(2) Cauchy sequence but does not converge in (0, 1]	1 20
	(3) Cauchy sequence that is convergent in (0, 1]	
	(4) None of these meviliand and less one vigras-mon views (2)	
86.	Let V be a vector space over R ³ . Which one of the following is a subspace of V?	not a
taioq od	(1) $\{(x, y, z) : 3x + y - z = 0, x, y, z \in R\}$.88
ai eixa-k	(2) $\{(x, y, z) : x + y - z = 0, 2x + 3y - z = 0, x, y, z \in R\}$	
HO.	(3) $\{(x, y, z) : x - 3y + 4z = 0, x, y, z \in R\}$	
*	(4) $\{(x, y, z) : x + y \ge 0, x, y, z \in R\}$	
87.	The value of k for which the vector $u = (1, k, 5)$ in V_3 (R) can be expressed as a linear combination of vectors $v = (1, -3, 2)$ and $w = (2, -1)$ is	essed 1, 1)
	(1) 3 badronnected (2) 8 dragmos (1) (2) -8	
	(3) -2 (4) None of these	

Set-X Code-C

Question No.	anoitest Questions no	Questi No.
88.	The dimension of the subspace W of R4 generated by	7,1
a busoi T	$\{(0,0,-3,-3),(1,-2,0,-3),(2,3,1,-4)\}$ 18	ARE.
	(1) 1 method upto third approaches (2) a sound built order bodiem	
V.	(3) 2 (4) None of these	M, PE
89.	The rank of the matrix $\begin{vmatrix} -3 & -6 & -3 \end{vmatrix}$ is	
	[5 10 5]	
Sept. No.	(1) 1 (2) 2	
	(3) 3 (4) None of these	
90.	The system of equations $2x - 3y + z = 9$; $x + y + z = 6$; $x - y + $ has	z = 2
	(1) a unique solution (2) infinite solutions	
	(3) no solution (4) none of these	
91.	For the initial value problem (IVP) $y' = f(x, y)$, $y(0) = 0$, which of following statement is true?	of the
	(1) $f(x, y) = \sqrt{xy}$ satisfies Lipschitz's condition and so IVP has u solution.	
(ES) 'V =	(2) $f(x, y) = \sqrt{xy}$ does not satisfy Lipschitz's condition and so IVP is solution.	nas n
	(3) f (x, y) = y satisfies Lipschitz's condition and so IVP has u solution.	niqu
	(4) f(x, y) = y does not satisfy Lipschitz's condition still the IV unique solution.	P ha

Question	amplinary	Code-
No.	enolise Questions	No
92.	The solution of the differential equation $\frac{dy}{dx} = 2xy$, $y(0) = 1$ by method upto third approximation is	Picaro
	(1) $1+x^2+\frac{x^4}{2}+\frac{x^6}{6}$ (2) $1+x^2+\frac{3x^4}{2}+\frac{x^6}{6}$	
	(3) $1+x^2+\frac{x^4}{4}+\frac{x^6}{6}$ (4) None of these	.68
93.	Using method of variation of parameters, the solution of the differential $y'' - 2y' = e^x \sin x$, is	
	(1) $y = c_1 + c_2 e^{2x} - \frac{1}{2} e^x \sin x$ (2) $y = c_1 e^x + c_2 e^{-x} - \frac{1}{2} e^x \sin x$	1.08
pino leo	3) $y = c_1 + c_2 e^x + \frac{1}{2} e^x \sin x$ (4) None of these (7) None of these	91.
14. L	Let n be non-negative integer. The eigen values of the Sturm-Lie roblem $y'' + \lambda y = 0$ with boundary conditions $y(0) = y(2\pi)$, $y'(0) = y(2\pi)$	ouville y' (2π)
and the same of th) If the motion is a sting of the property of	1. 1)
ОДІРС Б	(4) n² dodulos aupinu (2) None 34 abrah	

Set-X Code-C

Set-K lode-C		Set-X Code-C
Question No.	Questions Questions	Question Nd. : (
95.	Green's function of the boundary value problem $\frac{d^2u}{dx^2} + u = 0, \ u(0) = 0, \ u\left(\frac{\pi}{2}\right) = 0 \text{ is given by}$ (1) $G(x, \xi) = \cos \xi \sin x, \ 0 \le x < \xi$ (2) $G(x, \xi) = \cosh \xi \sinh x, \ 0 \le x < \xi$ (3) $G(x, \xi) = x (1 - \xi), \ 0 \le x < \xi$ (4) None of these	ee t
96.	The solution of Partial differential equation $xz p + yz q = x y$ is (1) $\phi(xy, yz - y^2) = 0$ (2) $\phi(x/y, z + y^2) = 0$ (3) $\phi(x/y, xy - z^2) = 0$ (4) None of these	
97.	The integral surface for the Cauchy problem $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 1$ which through the circle $z = 0$, $x^2 + y^2 = 1$ is (1) $x^2 + y^2 + 2z^2 + 2zx - 2yz - 1 = 0$ (2) $x^2 + y^2 + 2z^2 + 2zx + 2yz - 1 = 0$ (3) $x^2 + y^2 + 2z^2 - 2zx - 2yz - 1 = 0$ (4) None of these	h passes
98.	The partial differential equation $(x+1)\frac{\partial^2 u}{\partial x^2} - 2(x+2)\frac{\partial^2 u}{\partial x \partial y} + (x+3)is$ (1) Elliptic (2) Hyperbolic (3) Parabolic (4) None of these	$\frac{\partial^2 \mathbf{u}}{\partial \mathbf{y}^2} = 0$

Using method of separation of variables, the solution of Partial di	fferent
$\frac{\partial^2 \mathbf{u}}{\partial x^2} + \frac{\partial^2 \mathbf{u}}{\partial x^2} = 0$	Ficari or
(1)	
(1) None of these	
and $u(\infty, y) = 0$ for all y	
is given by = $(4y + x, y)x$ ϕ (2) $\theta = (4y - xy, y)x$ ϕ (2)	.00
(1) $u(x, y) = e^{-x} \sin y$ (2) $u(x, y) = e^{x} \sin y$	
(3) $u(x, y) = e^{-2x} \sin y$ (4) None of these	
	nen
of h he non-negative integer. The common well be smold (b)	
The paginal differential equation $(x+1)\frac{\partial^2 u}{\partial x^2} - 2(x+2)\frac{\partial^2 u}{\partial x} + (x^2)$	(2n)
1_n (3) ning	
The state of the s	
(3) Parabolic (4) None of these	
	subject to the boundary conditions: $u(0, y) = \sin y \text{ for all } y$ and $u(\infty, y) = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\sin y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 \text{ for all } y$ $\cos y = 0 for all $

Set-X Code-C

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SET-"X" S. Rahing (Total No. of printed pages: 29) DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO) (PHD/URS-EE-DEC.-2022) Sr. No. 10052 **MATHEMATICS** Code Max. Marks: 100 Time: 11/4 Hours **Total Questions: 100** (in words) (in figure)_ Roll No. Father's Name: 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. All questions are compulsory. The candidates must return the Question book-let as well as OM answer-sheet to the Invigilator concerned before leaving the Examination Ha failing which a case of use of unfair-means / mis-behaviour will be register against him / her, in addition to lodging of an FIR with the police. Further t 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. Question Booklet along with answer key of all the A,B,C and D code will be uploaded on the university website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing within 24 hours of uploading the same on the University Website. 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 book-let itself. Answers MUST NOT be ticked in the Question book-let. 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. Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-7. Sheet. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

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Question No.	and and Questions and	
1.00	Which of the following functions is not a function of bounded variation?	
	(1) $f(x) = \begin{cases} x \sin(\pi/x), & \text{if } 0 < x \le 1 \\ 0, & \text{if } x = 0 \end{cases}$ (2) $f(x) = \begin{cases} x^2 \sin(1/x), & \text{if } x \ne 0 \\ 0, & \text{if } x = 0 \end{cases}$	
	(3) $f(x) = 3x^2 - 2x^3, -2 \le x \le 2$ (4) None of these	
2.	Choose the incorrect statement.	
	(1) The set of all irrational numbers in [0, 1] is measurable.	
g is not	(2) Every non-empty one set has positive measure.	
	(3) Every subset of a set of measure zero is not of measure zero.	
	(4) None of these = x = y = x = x = x = x = x = x = (x, y, x) = (x)	
3.	The directional derivative of the function ϕ (x, y) = $\frac{xy}{x^2 + y^2}$ at the point (0, 1) along a line making an angle of 30° with positive direction of x-axis is	
4851288 (2, = 1,	The section of the section of the for which the west section of the section of th	
	(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{\sqrt{3}}{2}$ (2) $\frac{\sqrt{3}}{2}$	
	(3) $\sqrt{3}$ each to each (4) None of these (8)	
4.	The metric space (R, d), where d is a usual metric, is	
	(1) compact (2) disconnected	
	(3) connected but not compact (4) compact and connected	

Question	Code-]
No.	No.
5.	In a metric space $(0, 1]$ with usual metric $d(x, y) = x - y $, the sequence
(0+x1	$\langle - \rangle$ is a
-[0= ×3	(1) Not a Cauchy sequence
	(2) Cauchy sequence but does not converge in (0, 1]
	(3) Cauchy sequence that is convergent in (0, 1]
	(4) None of these
6.	Let V be a vector space over R ³ . Which one of the following is not a subspace of V?
-019	(1) $\{(x, y, z) : 3x + y - z = 0, x, y, z \in R\}$
	(2) $\{(x, y, z) : x + y - z = 0, 2x + 3y - z = 0, x, y, z \in \mathbb{R}\}$
the per	(3) $\{(x, y, z) : x - 3y + 4z = 0, x, y, z \in R\}$
nof x-axis	(4) $\{(x, y, z) : x + y \ge 0, x, y, z \in R\}$
7.	The value of k for which the vector $u = (1, k, 5)$ in V_3 (R) can be expressed as a linear combination of vectors $v = (1, -3, 2)$ and $w = (2, -1, 1)$ is
	(1) 3 (2) -8
	(3) -2 seeds to seed (4) None of these (4)
8.	The dimension of the subspace W of R4 generated by
	$\{(3, 8, -3, -5), (1, -2, 5, -3), (2, 3, 1, -4)\}$ is
nected	(1) 5.1 connected but not (2) act (4) compact alid (1)
	(3) 2 (4) None of these

Question	Code-D		
No.	Questions Problems		
khroVi s	initiative as more more to fightes 20051 to 6d X and X and X and X		
9.	The rank of the matrix $\begin{vmatrix} -3 & -6 & -3 \end{vmatrix}$ is		
4	5 . 10 mas data marion data menulo		
	(1) 1 is mission (2) 2 (- x) (1) (1)		
	(3) 3 (4) None of these		
10.	The system of equations $2x - 3y + z = 9$; $x + y + z = 6$; $x - y + z = 2$		
	(1) Y (X - W) (X - W) bas Winhard distribution with a distribution with a distribution of the control of the co		
	(2) Illimite solutions		
	(3) no solution (4) none of these		
11.	Let p be the probability that a coin will fall head in a single toss in order		
	to test $H_0 = p = \frac{1}{2}$ against $H_1 : p = \frac{3}{4}$. The coin is tossed 5 times and H_0 is		
	rejected if more than 3 heads are obtained. Then the probability of type I error is		
	(1) 1/16 and to end (2) 3/16		
	(3) 5/16 (4) None of these		
12.	Given the observations 0.8, 0.71, 0.9, 1.2, 1.68, 1.4, 0.88, 1.62 from the uniform distribution on $(\theta - 0.2, \theta + 0.8)$ with $-\infty < \theta < \infty$, which of the following is a maximum likelihood estimate for θ ?		
The state of	(1) 0.7 (2) 0.9 (3) 1.1		
	(3) 1.1		
13.	If X ₁ , X ₂ , X ₃ ,, X _n is a random sample from a normal population		
	N (μ , 1). Then $t = \frac{1}{n} \sum_{i=1}^{n} X_i^2$ is a unbiased estimator of		
	(1) μ^2 (2) $\mu^2 - 1$		
	(1) μ^2 (2) $\mu^2 - 1$ (3) $1 - \mu^2$ (4) $\mu^2 + 1$		

Question No.	Questions Code-D
14.	Let X_1, X_2, \ldots, X_n be a random sample of size n from a p-variate Normal distribution with mean μ and positive definite covariance matrix \sum . Choose the correct statement (1) $(X_1 - \mu)' \sum^{-1} (X_1 - \mu)$ has chi-square distribution with 1 d.f.
y + z =	(2) $\overline{X} \overline{X}'$ has Wishart distribution with p d.f. (3) $\sum_{i=1}^{n} (X_i - \mu)(X_i - \mu)'$ has Wishart distribution with p d.f.
15.	(4) $X_1 + X_2$ and $X_1 - X_2$ are independently distributed.
l _g H bag	In a trivariate distribution : $\sigma_1 = 2$, $\sigma_2 = \sigma_3 = 3$, $r_{12} = 0.7$, $r_{23} = r_{31} = 0.5$. (1) 0.1423 (2) 0.7211
	(3) 0.4892
nom el	The total number of all possible Latin squares of order 3 is (1) 12 (2) 9 (2) 9
	(3) 6 (4) None of these The Mean time to failure (MTTE) 6
	The Mean time to failure (MTTF) for an exponential distribution with parameter λ is (1) λ (2) λ^2
	(3) 1/\(\lambda\) (4) None of these (8)

PHD/URS-EE-DEC.-2022-(Mathematics)-Code-D

Set-X Code-D

Question	Code-D		
No.	Questions (College Parties of Par		
18.	The maximum value of $Z = 2x + 3y$ subject to the constraints:		
	$x + y \le 30$; $3 \le y \le 12$; $x - y \ge 0$; $0 \le x \le 20$, is		
o bas en	(1) 72 (2) 60 (2) 60 (8) (8) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9		
ie kinetie	(3) 49 (4) None of these		
19.	Men arrive in a queue according to a Poisson process with rate λ_1 and women arrive in the same queue according to another Poisson process with rate λ_2 . The arrivals of men and women are independent. The probability that the first arrival in the queue is a man is λ_1		
	(1) $\frac{\lambda_1}{\lambda_1 + \lambda_2}$ begins at the mass (2) $\frac{\lambda_2}{\lambda_1 + \lambda_2}$		
	(3) $\frac{\lambda_1}{\lambda_2}$ resistant the state of $\frac{\lambda_1}{\lambda_1}$ resistant that $\frac{\lambda_1}{\lambda_1}$ resistant that $\frac{\lambda_2}{\lambda_1}$ resistant that $\frac{\lambda_2}{\lambda_1}$ resistant $\frac{\lambda_2}{\lambda_1}$ resistant $\frac{\lambda_2}{\lambda_1}$ resistant $\frac{\lambda_2}{\lambda_1}$		
20.	Arrivals at a telephone booth are considered to be Poisson with an average time of 12 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 4 minutes. Then the probability that a person arriving at the booth will have to wait in the queue is		
	(1) $\frac{2}{3}$ below the first transfer to $\frac{1}{3}$ (2) $\frac{1}{3}$		
	(3) $\frac{1}{6}$ (4) None of these		

Question	Code-D
No.	anoites Questions moins Q
21.	The resolvent kernel for the integral equation
	$\phi(x) = 29 + 6x + \int_{0}^{x} [5 - 6(x - \xi)] \phi(\xi) d\xi, \text{ is}$
	(1) $9 e^{3(x-\xi)} - 4 e^{2(x-\xi)}$ (2) $9 e^{2(x-\xi)} - 4 e^{3(x-\xi)}$
	(3) $9 e^{3(x-\xi)} - e^{-2(x-\xi)}$ (4) None of these
22.	Consider the two dimensional motion of a mass m attached to one end of a spring whose other end is fixed. Let k be the spring constant. The kinetic energy T and the potential energy V of the system are given by
e h, and n process eut. The	$T = \frac{1}{2} m (\dot{r}^2 + (r\dot{\theta})^2)$ and $V = \frac{1}{2} k r^2$,
	where $\dot{r} = \frac{dr}{dt}$ and $\dot{\theta} = \frac{d\theta}{dt}$ with t as time.
	Then which of the following statement is correct?
	(1) r is an ignorable coordinate
	(2) θ is not an ignorable coordinate
	(3) r² θ remains constant throughout the motion
neverag	(4) r ġ remains constant throughout the motion
23.	The Lagrange's equation for a simple pendulum is, (where symbols have their usual meanings)
	(1) $\dot{\theta} + \frac{g}{\ell} \sin \theta = 0$ (2) $\ddot{\theta} + \frac{g}{\ell} \sin \theta = 0$
	(3) $\ddot{\theta} + \frac{g}{\ell} \tan \theta = 0$ (4) None of these

Question No.	Questions Questions
24.	Let q_i and \dot{q}_i respectively are the generalized coordinates and velocity of a mechanical system and p_i are its generalized momenta. If H is the Hamiltonian of the system, then Hamilton's equations of motion are
	$(1) \dot{\mathbf{q}}_{i} = \frac{\partial \mathbf{H}}{\partial \mathbf{p}_{i}}, \dot{\mathbf{p}}_{i} = \frac{\partial \mathbf{H}}{\partial \mathbf{q}_{i}} $ $(2) \dot{\mathbf{q}}_{i} = -\frac{\partial \mathbf{H}}{\partial \mathbf{p}_{i}}, \dot{\mathbf{p}}_{i} = \frac{\partial \mathbf{H}}{\partial \mathbf{q}_{i}} $
nevig.m	(3) $\dot{q}_i = \frac{\partial H}{\partial p_i}, \dot{p}_i = -\frac{\partial H}{\partial q_i}$ (4) $\dot{q}_i = -\frac{\partial H}{\partial p_i}, \dot{p}_i = -\frac{\partial H}{\partial q_i}$
25.	If $L = [L_1, L_2, L_3]$ is the vector moment of the external forces about a fixed point O , $\omega = [\omega_1, \omega_2, \omega_3]$ the angular velocity, and A , B , C are the principal moments of inertia, then Euler's dynamical equations of motion are
	(1) $L_1 = A\omega_1 - (B - C)\omega_2\omega_3$, $L_2 = B\omega_2 - (C - A)\omega_3\omega_1$, $L_3 = C\omega_3 - (A - B)\omega_1\omega_2$
	(2) $L_1 = A\dot{\omega}_1 - (B - C)\omega_2\omega_3$, $L_2 = B\dot{\omega}_2 - (C - A)\omega_3\omega_1$, $L_3 = C\dot{\omega}_3 - (A - B)\omega_1\omega_2$
and the same	(3) $L_1 = A\dot{\omega}_1 + (B - C)\omega_2\omega_3$, $L_2 = B\dot{\omega}_2 + (C - A)\omega_3\omega_1$, $L_3 = C\dot{\omega}_3 + (A - B)\omega_1\omega_2$ (4) None of these
26.	An integer is chosen at random from two hundred digits. Then the probability that the integer is divisible is divisible by 6 or 8 is
	(1) 3/4 (2) 1/2
	(3) 3/8 (4) 1/4
27.	In a bolts factory, machines I, II and III manufacture respectively 25%, 35% and 40% of the total bolts. Of their total output 5%, 4% and 2% are respectively defective bolts. A bolt is drawn at random from the product. If the bolt drawn is found to be defective, what is the probability that it is manufactured by machine II?
	(1) 0.41 (2) 0.27
	(3) 0.13 (4) None of these

Question No.	adottes Questions and addisons
28.00 edi ai	Let X be a continuous random variable with probability density function (p.d.f.) defined as $f(x) = 6x(1-x)$, $0 \le x \le 1$.
0 019	Then the value of number b such that $P(X < b) = P(X > b)$ is
	(1) 1/4 H5 A H5
	(3) 1/2 (4) None of these
29.	If X and Y are two random variables having joint density function given by
t a fixed tripopal pre	$f(x, y) = \begin{cases} 6x^2y ; \theta < x < 1, 0 < y < 1 \\ \theta ; \text{ otherwise} \end{cases}$
m of CE	Then P (X + Y < 1) is
B) 0, 0,	(1) 1/4 (2) 1/10 (2) 1/10 (2)
m fm (g	(3) 3/8 (4) None of these
30.	For $k = 1, 2,, 10$, let the probability density function of the random variable X_k is given by
	$f_{x_k}(x) = \begin{cases} e^{-\frac{x}{k}} & \text{substitute} \\ \frac{e^{-\frac{x}{k}}}{k}, & x > 0 \end{cases}$
	otherwise in and the botal bolts. Of their total output 5%, 4% and 10 the botal bolts. Of their total output 5%, 4% and 10 the botal bolts.
distribution	Then the value of $E\left(\sum_{k=1}^{10} k X_k\right)$ is equal to
	(1) 385
	(3) 144 panda lo suel/ (1) (4) 110 (81.0 s.m)

X-te8 Code-D

Question No.	Questions Code-1
31.	For the initial value problem (IVP) $y' = f(x, y)$, $y(0) = 0$, which of the following statement is true?
	(1) $f(x, y) = \sqrt{xy}$ satisfies Lipschitz's condition and so IVP has unique solution.
	(2) $f(x, y) = \sqrt{xy}$ does not satisfy Lipschitz's condition and so IVP has no solution.
	(3) f (x, y) = y satisfies Lipschitz's condition and so IVP has unique solution.
	(4) $f(x, y) = y $ does not satisfy Lipschitz's condition still the IVP has unique solution.
32.	The solution of the differential equation $\frac{dy}{dx} = 2xy$, y (0) = 1 by Picard's method upto third approximation is
	(1) $1+x^2+\frac{x^4}{2}+\frac{x^6}{6}$ (2) $1+x^2+\frac{3x^4}{2}+\frac{x^6}{6}$
BOSSING	(3) $1+x^2+\frac{x^4}{4}+\frac{x^6}{6}$ (4) None of these
	Using method of variation of parameters, the solution of the differential equation $y'' - 2y' = e^x \sin x$, is
	(1) $y = c_1 + c_2 e^{2x} - \frac{1}{2} e^x \sin x$ (2) $y = c_1 e^x + c_2 e^{-x} - \frac{1}{2} e^x \sin x$
	(3) $y = c_1 + c_2 e^x + \frac{1}{2} e^x \sin x$ (4) None of these

Question No.	Questions
34.	Let n be non-negative integer. The eigen values of the Sturm-Liouvil problem $y'' + \lambda y = 0$ with boundary conditions $y(0) = y(2\pi)$, $y'(0) = y'(2\pi)$
supim	 (1) n (2) n² π² (3) n π (4) n²
35.	Green's function of the boundary value problem
supini	$\frac{\mathrm{d}^2 u}{\mathrm{d}x^2} + u = 0, \ u(0) = 0, \ u\left(\frac{\pi}{2}\right) = 0 \text{ is given by}$
P has	(1) $G(x, \xi) = \cos \xi \sin x$, $0 \le x < \xi$
	(2) G $(x, \xi) = \cosh \xi \sinh x$, $0 \le x < \xi$
e'bres	(3) G $(x, \xi) = x (1 - \xi), 0 \le x < \xi$
	(4) None of these
36.	The solution of Partial differential equation $xz p + yz q = x y$ is
10	(1) $\phi(xy, yz - y^2) = 0$ (2) $\phi(x/y, z + y^2) = 0$
	(3) $\phi(x/y, xy - z^2) = 0$ (4) None of these
37.	The integral surface for the Cauchy problem $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 1$ which passes
laitnere	through the circle $z = 0$, $x^2 + y^2 = 1$ is
	(1) $x^2 + y^2 + 2z^2 + 2zx - 2yz - 1 = 0$
	(2) $x^2 + y^2 + 2z^2 + 2zx + 2yz - 1 = 0$
	(3) $x^2 + y^2 + 2z^2 - 2zx - 2yz - 1 = 0$
100	(4) None of these
	esent to enovi. (a) to the state of the estimates (a)

The partial differential equation $(x+1)\frac{\partial^2 u}{\partial x^2} - 2(x+2)\frac{\partial^2 u}{\partial x \partial y} + (x+3)\frac{\partial^2 u}{\partial y^2} =$ is
(1) Elliptic (2) Hyperbolic (3) Parabolic (4) None of these
Using method of separation of variables, the solution of Partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the boundary conditions: $u \ (0, y) = \sin y \text{ for all } y$ and $u \ (\infty, y) = 0 \text{ for all } y$
(1) $u(x, y) = e^{-x} \sin y$ (2) $u(x, y) = e^{x} \sin y$ (3) $u(x, y) = e^{-2x} \sin y$ (4) None of these
Let $u(x, t) = e^{iwx} v(t)$ with $v(0) = 1$ be a solution to $\frac{\partial u}{\partial t} = \frac{\partial^3 u}{\partial x^3}$. Then 1) $u(x, t) = e^{iw(x-w^2t)}$ (2) $u(x, t) = e^{iwx-w^2t}$ 3) $u(x, t) = e^{iw(x+w^2t)}$ (4) $u(x, t) = e^{iw^3(x-t)}$

Question No.	Questions Questions	anise is
41.	The Laurent series expansion of $f(z) = \frac{z}{(z-1)(z-3)}$ for $0 < z-1 $ equal to	< 2, i
	(1) $\frac{-3}{4} \sum_{n=0}^{\infty} \frac{(z-1)^n}{2^n} - \frac{1}{2(z-1)}$ (2) $\frac{3}{4} \sum_{n=0}^{\infty} \frac{(z-1)^n}{2^n} - \frac{1}{4(z-1)}$	
faitner.	(3) $\frac{1}{4} \sum_{n=0}^{\infty} \frac{(z-1)^{-n}}{2^n} + \frac{(z-1)}{2}$ (4) None of these	
42.	The residue of the function $f(z) = \frac{1}{(z^2 + 1)^3}$ at $z = i$, is	
5.	(i) $\frac{3}{16i}$ (2) $\frac{3}{2i}$ (2) $\frac{3}{2i}$ (2) $\frac{3}{2i}$ (2) $\frac{3}{2i}$	
	(3) $\frac{4}{3i}$ (4) None of these value (2) $\frac{4}{3i}$ (2)	sf
	The fixed points of the Mobius transformation $w = \frac{(2+i)z-2}{z+i}$ are	
	(1) i, -i 6 (2) 0, 1 (2) 0, 1	. 02
	(3) $-1, 1$ (4) $1+i, 1-i$ (5) $-1, 1$ (6) $-1, 1$ (7) $-1, 1$ (7) $-1, 1$ (8) $-1, 1$ (9) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1) $-1, 1$ (1	

Question No.	Code-	
44.	The image of circle $ z-2 = 2$ under the Mobius transformation $w = \frac{z}{z+1}$ is a circle in w-plane with	
Ogumusis	(1) Centre $\left(\frac{1}{5}, 0\right)$ and radius $\frac{2}{5}$ (2) Centre $\left(\frac{2}{5}, 0\right)$ and radius $\frac{1}{5}$	
	(3) Centre $\left(\frac{1}{5}, 0\right)$ and radius $\frac{1}{5}$ (4) Centre $\left(\frac{2}{5}, 0\right)$ and radius $\frac{2}{5}$	
45.	If 9 colours are used to paint 100 houses, then atleast house will be of the same colour.	
34.	(1) 18 (2) 15	
	(3) 12 (4) 10	
46.	The congruence $35x \equiv 14 \pmod{21}$ has	
	(1) 5 solutions (2) 6 solutions	
	(3) 7 solutions (4) No solution	
17.	The primitive roots of 32 are	
(1) 3, 7 Have been a lamb at (2) 2, 5 Head and a man A	
	3) 5, 7 (4) None of these	

Question No.	angles Questions notisons
48.	Let G = {0, 1, 2, 3, 4, 5, 6, 7} be a group under the binary operation 'addition modulo 8', then the order of element 5, is
	(1) 1 (2) 2 diw onelq-w ni olonio n si
i anibu	(3) 4 (4) 8
49.	The centre of a non-abelian group of order 343 always has elements in its centre.
adine $\frac{2}{5}$	(1) 3 (2) satisfy (1) (2) 17 km (0, 1) same (6)
	(3) 5 (4) None of these
50.	Let G be a group of order 20449. Then
	(1) G has only one Sylow-11 subgroup
	(2) G has only two Sylow-11 subgroups
	(3) G has only four Sylow-11 subgroups
	(4) None of these and (18 bom) 41 = xd8 sometrance adT 3.34.
	enoisofre 0 [-2 2 -3] enociples a (1)
51.	Consider the matrix $A = \begin{bmatrix} 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$, then
	(1) A has no real eigen values.
2 3	(2) A has both positive and negative real eigen values.
	(3) All real eigen values of A are positive.
	(4) All real eigen values of A are negative.

Question No.	Code-D
52.	Which of the following is a linear transformation?
136-5	(1) $T(x, y) = (1 + x, y)$ for all $(x, y) \in \mathbb{R}^2$
	(2) $T(x, y) = (x, x + y)$ for all $(x, y) \in \mathbb{R}^2$
	(3) $T(x, y) = (x^2, y)$ for all $(x, y) \in \mathbb{R}^2$
	(4) None of these
53.	The matrix representing the linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ defined by $T(x_1, x_2) = (2x_2, 3x_1 - x_2)$ relative to the basis $\{(1, 3), (2, 5)\}$ is
	[30 48] [-30 48]
	[20 48] [20 48]
	$ \begin{bmatrix} 30 & 48 \\ -18 & -29 \end{bmatrix} \qquad (4) \begin{bmatrix} -30 & -48 \\ 18 & 29 \end{bmatrix} $
ad sonu?	bidylann ne to then leen out of tun a twat - the -in/ - off
54.	Let C ³ be a complex inner product space.
	If the vectors $\mathbf{u}_1 = (1, 2\mathbf{i}, \mathbf{i})$, $\mathbf{u}_2 = (0, 1 + \mathbf{i}, 1)$, $\mathbf{u}_3 = (2, 1 - \mathbf{i}, \mathbf{i}) \in \mathbb{C}^3$, then the vector orthogonal to both \mathbf{u}_1 and \mathbf{u}_3 is
	(1) $(-3+i,-i,1-5i)$ (2) $(-3+i,-i,1+5i)$
	(3) $(3+i, -i, 1+5i)$ (4) None of these
	[9 3 -3]
55.	The quadratic form corresponding to symmetric matrix 3 2 -4 is
	[-3 -4 2]
	(1) $9x^2 - 2y^2 + 2z^2 - 6xy - 6xz - 8yz$
	$(2) 9x^2 + 2y^2 + 2z^2 + 6xy - 6xz - 8yz$
	(3) $9x^2 + 2y^2 - 2z^2 + 6xy + 6xz + 8yz$

	~9]	(69)	
100			
		DAY:	

Question No.	and its an Questions Inches
56.	The radius of convergence of the power series $\sum_{n=0}^{\infty} \frac{(n!)^2}{(2n)!} z^n$ is
	(1) 4 $(x, y) = (x, x + y)$ for all $(x, y) = (x, y)$ T $(x, y) = (x, y)$
	(3) 2 (4) None of these
57.	Which one of the following functions f (z), of the complex variable z, analytic over the entire complex plane?
	(1) $f(z) = \ln(z)$ (2) $f(z) = e^{1/z}$ (3) $g(z) = e^{1/z}$ (1)
70.	(3) $f(z) = \frac{1}{1-z}$ (4) $f(z) = \cos z$
8.	If $u = (x - 1)^3 - 3xy^2 + 3y^2$ is the real part of an analytic function $f(z) = u + iy$, then the image
	f(z) = u + iv, then the imaginary part v of $f(z)$ is
then th	(1) $3x^2y - 6xy - 3y + y^3 + c$ (2) $3x^2y + 6xy + 3y + y^3 + c$
	(3) $3x^2y - 6xy + 3y - y^3 + c$ (4) None of these (5)
59.	The value of the integral $\int \overline{z} dz$, from $z = 0$ to $z = 4 + 2i$ along the curve
江	given by $z = t^2 + it$, is equal to the property of $t = t^2 + it$, is equal to the property of $t = t^2 + it$.
	(1) $5 - \frac{8}{3}i$ (2) $10 - \frac{8}{3}i$ (2) $10 - \frac{8}{3}i$
	(3) $10 - \frac{4}{3}i$ (4) None of these
	(4) None, of these negative sead to sale (4)

Questio No.	Code-
60.	The value of the integral $\int_C \frac{e^{-z}}{z^2} dz$, where C is a unit circle about the origin, described in positive sense, is equal to
	(1) 0 1 (2) π i (3) (2) π i (4) (3) (3)
lucofes	(3) $-2\pi i$ (4) None of these
61.	The non-isomorphic abelian groups of order 20 are
	(1) Z_4 , $Z_2 \times Z_2 \times Z_5$ (2) Z_8 , $Z_2 \times Z_5$
6. The	(3) $Z_4 \times Z_5$, $Z_2 \times Z_2 \times Z_5$ (4) None of these
62.	Let Z [x] be the ring of polynomials over the ring of integers. Then
	(1) the ideal <x> is a prime ideal but not a maximal ideal</x>
	(2) the ideal <x> is not a prime ideal but a maximal ideal.</x>
	(3) the ideal <x> is a prme ideal as well as a maximal ideal.</x>
	(4) the ideal <x> is neither a prime ideal nor a maximal ideal.</x>
33.	Which of the following is not a unique factorization domain?
	(1) A Euclidean ring. (2) The ring < Z, +, . > of integers.
((3) $Z[\sqrt{-5}]$ (4) None of these

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Question No.	anoitan Questions political
64.	60.
	(1) $2x^5 + 15x^3 + 3x + 6$ (2) $x^3 + 3x + 1$
	(3) $8x^3 - 6x - 1$ (4) All of the above
65.	The degree of splitting field of $x^4 - x^2 - 2$ over the field Q of rational numbers, is
	The non-isomorphic abelian groups of order 20 are (1)
	(3) 2 (4) None of these
56.	Let F be a finite field and let K/F be a field extension of degree 6. Then the Galois group of K/F is isomorphic to
	(1) the cyclic group of order 6
	(2) the permutation group on {1, 2, 3}
	(3) the permutation group on {1, 2, 3, 4, 5, 6}
	(4) the permutation group on {1}
67.	Which of the following spaces is not separable?
	(1) R with the trivial topology
	2) The Cantor set as a subspace of R
	3) R with the discrete topology
1	4) None of these and (b)

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Set-X Code-D

Questio No.	Code Questions
68.	Which one of the following topological spaces is not compact?
	(1) Indicaret
	(1) Indiscrete topological space
	(2) Infinite discrete topological space
	(3) A topological space with cofinite topology
	(4) None of these
1	The state of the s
69.	Let X be a topological space and U be a proper dense open subset of X. Then which of the following statement is true?
	Then which of the following statement is true?
	(1) If X is connected, then U is connected.
	(2) If X is compact, then U is compact.
	(3) If X\U is compact, then X is compact.
	(4) If X is compact, then X\U is compact.
70.	
	Let X and Y be two topological spaces and let $f: X \to Y$ be a continuous function. Then
720	(1) $f^{-1}(K)$ is connected if $K \subset Y$ is connected
8.	(2) $f^{-1}(K)$ is compact if $K \subset Y$ is compact
20. 12	(3) $f(K)$ is connected if $K \subset X$ is connected
	(4) None of these.
1.	Using Newton Raphson's method, the smallest positive root of the equation $3x^3 - 9x^2 + 8 = 0$, lying between 1 and 2, is
((1) 1.0327 (2) 1.2261
(3) 16514
- N	(4) None of these

Set-X

Question No.			stions	Ques	stions				ode-
72.	Using Ga	uss Elimii	nation me	ethod, t	he solut	ion of fo	llowing	equati	ons
	4x + 3y +	manager,	x + y + 22	and the same	7 × 1			1 1 Lat.	
	is given b	У	908	qa Leolg					
	(1) x = -	-1, y = 2, z	= 3	(2)	x = 1,	y = 2, z	= 3	1884	
85.	(3) x = -	-1, y = -2	z = 3	(4)	x = 1,	y = -2,	z = 3		
73.	Given tha	it	the a pr	i bue e	onge La	agellengo.	2 od 2	Total	, GE
	X		bate y and	3.0					
	f(x)	168		-	2 paid				
		of third d		fferenc	e of the	function	n f (x) is	(8)	
	(1) 5			(2)	1				
	(3) -1			(4)	-2		Thus X		70.
74.	Consider	the data g	iven belo	w:	li balos	nfilos er	(M) 1-3	(0)	
		0 1	2	3	-	0005 ET	6	7	8
	f(x)	0 4.13	7.20	9.25	10.25	10.00	9.05	7.12	6.2
		th the mar				onest to			
dustic	Using Sin	ipson's one	e third ru	ile, the	value of	$\int_{0}^{8} f(x) dx$	lx is		.17
	(1) 34.5		32.1 (S	250.00	47.3				
	(3) 52.8		enck ((4)	60.4		1.051		

Question	Code-
No.	enoites Questions): Boites
75.	Given $\frac{dy}{dx} = -y$ with y (0) = 1. Then using Euler's method, the value of y (0.02) by taking step size h = 0.01, is
	(1) 3.6845 (2) 2.7862
70	(3) 0.9801 (4) 0.5401 $\frac{3}{5} = x$ (1)
76.	The Euler's equation corresponding to the functional
	$\int_{0}^{\pi} (y'^{2} - y^{2} + 4y \cos x) dx \text{ subject to } y(0) = 0, y(\pi) = 0 \text{ is}$
	(1) $\frac{d^2y}{dx^2} + y = 2 \sin x$ (2) $\frac{d^2y}{dx^2} + y = 2 \cos x$
	(3) $\frac{d^2y}{dx^2} - y = 2 \tan x$ (4) None of these
77.	The extremal of the functional
ii žbra d	$I[y(x)] = \int_{1}^{2} (y'^{2} - 2xy) dx$ subject to $y(1) = 0$, $y(2) = -1$ is
	(1) $y = \frac{1}{6} (x - x^3)$ (2) $y = x^2 - 1$
	(3) $y = \frac{1}{6} (7x - x^3)$ (4) None of these

Question No.	anuitee Questions not soul
78.	The extremal of $\int_{1}^{2} \frac{\dot{x}^{2}}{t^{3}} dt$; $x(1) = 3$, $x(2) = 18$ (where $\dot{x} = \frac{dx}{dt}$) using Lagrange's equation is given by which of the following? (1) $x = \frac{15}{7}t^{3} + \frac{6}{7}$ (2) $x = 5t^{2} - 2$ (3) $x = 5t^{3} + 3$ (4) $x = t^{4} + 2$
79.	The solution of the linear integral equation $\phi(x) = (1+x)^2 + \int_{-1}^{1} (x\xi + x^2\xi^2) \phi(\xi) d\xi, \text{ is}$ (1) $\phi(x) = 1 + 6x + \frac{25}{9}x^2$ (2) $\phi(x) = 1 - 6x + \frac{5}{9}x^2$ (3) $\phi(x) = 1 + 3x - \frac{25}{9}x^2$ (4) None of these
80.	The solution to the integral equation $\phi(x) = x + \int_0^x \sin(x - \xi) \phi(\xi) d\xi$ is given by (1) $x^2 + \frac{x^3}{3}$ (2) $x - \frac{x^3}{3!}$ (3) $x^2 - \frac{x^3}{3!}$ (4) $x + \frac{x^3}{3!}$

X-ta8

Question	Code-
No.	Page Questions
81.	The infimum and the supremum of the set $\left\{\frac{(-1)^n}{n}: n \in \mathbb{N}\right\}$ are respectively
	(1) $1, \frac{-1}{2}$ (2) $-1, \frac{1}{2}$
	(3) -1, 0 (4) None of these
82.	Which of the following sequence is divergent?
	(1) $a_n = 1 + \frac{2}{n}$ (2) $b_n = \frac{3n-1}{1+2n}$
	(3) $c_n = 1 + \frac{(-1)^n}{n}$ (4) $d_n = \sin n$
83.	Consider the statements:
Ma en Josep	(a) The series $\frac{1}{3} - \frac{2}{5} + \frac{3}{7} - \frac{4}{9} + \dots$ is convergent.
	(b) The series $1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \dots$ is convergent.
20 7/1-0	Then we denied in the state of
	(1) Both the statements (a) and (b) are true
mogrado	(2) The statement (a) is true and (b) is false
	(3) The statement (a) is false and (b) is true
	(4) Neither (a) nor (b) is true

Question No.	Questions Annual Questions
84.	Every bounded sequence has at least one limit point. This represents
	(1) Archimedean Property (2) Heine-Borel theorem
	(3) Bolzano-Weierstress theorem (4) Denseness Property
85.	Let $f:[0,\infty)\to R$ be a function, where R denotes the set of all reanumbers. Then which one of the following statements is true?
79.	(1) If f is continuous and $\lim_{x\to\infty} f(x)$ is finite, then f is uniformly continuous
	(2) If f is bounded and continuous, then f is uniformly continuous.
	(3) If f is uniformly continuous, then $\lim_{x\to\infty} f(x)$ exists.
	(4) None of these
86.	Which of the following is false?
	(1) The sequence $\{f_n\}$, where $f_n(x) = \frac{1}{x+n}$, is uniformly convergent in any interval $[0, b]$, $b > 0$.
l m	The series 1 + (2) 31 ath to require on the convergent
	(2) The sequence $\{f_n\}$, where $f_n(x) = \frac{n^2x}{1+n^3x^2}$, is uniformly convergent of
	the interval [0, 1]. $\frac{1}{2} = \frac{1}{2} = 1$
	(3) The sequence $\{f_n\}$, where $f_n(x) = \tan^{-1} nx$, $x \ge 0$, is uniformly convergent in any interval $[a, b]$, $a > 0$.
	(4) None of these (a) Ted (a) Ted (b) Ted (c)

Question No.	Code-1
87.	For which of the following function, Rolle's theorem is not applicable?
	(1) $f(x) = \cos 2x \text{ in } [-\pi/4, \pi/4]$ (2) $f(x) = \frac{\sin x}{e^x} \text{ in } [0, \pi]$
eat no	(3) $f(x) = x^3 - 6x^2 + 11x - 6 in[1,3]$ (4) $f(x) = x in [-1, 1]$
88.	If $f(x) = x$, $x \in [0, 1]$ and let $P = \left\{0, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1\right\}$ be the partition of $[0, 1]$, then $U(f, P)$ is
erlt bas	(1) 23/36 (2) 31/36
10 momb	(3) 49/36 (4) None of these
89.	If a function f defined on [0, 1] as $f(x) = \begin{cases} \sin(\frac{1}{x}), & \text{if } x \text{ is irrational}, \\ 0, & \text{otherwise} \end{cases}$, then
	(1) f is not bounded (1) (2) (2) (3) (4) (4) (5) (6)
	(2) f is R-integrable
181	(3) f is not R-integrable since f is not bounded
	(4) f is not R-integrable since lower and upper integrals of f are unequal
4500	(3) 1/6 seart to enov (a) (b) (d) 120 Fra (b)

Question No.	Questions Questions					
90.	Consider the following improper integrals $I_1 = \int_0^\infty \frac{\sin^2 x}{x^2} dx \text{ and } I_2 = \int_1^\infty \frac{x^3}{(1+x^2)^5} dx \text{ , then }$					
	(1) Both are divergent (2) I_1 converges but not I_2					
	(3) I ₂ converges but not I ₁ (4) Both are convergent					
91.	If 2% of the items manufactured by a factory are defective, then the probability that there are 3 defective items in a sample of 100 items is					
11 101	(1) 0.48 (2) 0.33					
	(3) 0.27 (4) 0.18 (1) U redd					
92.	For a certain normal distribution, the first moment about 10 is 40 and the fourth moment about 50 is 48. Then the mean and standard deviation of the distribution respectively are					
	(1) 20, 3 (2) 30, 4					
	(3) 50, 2 (4) None of these					
93.	The characteristic function of χ²-distribution with n degrees of freedom is					
	(1) $(1-2it)^{n/2}$ (2) $(1+2it)^{n/2}$ used for each (1)					
	(3) $(1-2it)^{-n/2}$ (4) None of these					
94.	If Tchebycheff's inequality for a random variable X with mean 12 is					
S18 1 1	$P \{6 < X < 18\} \ge \frac{3}{4}$, then the standard deviation of X is					
-	(1) 2 (2) 3 Laupana					
	(3) 8 (4) None of these					

Question No.	Code-					
95.	The sum of all the elements of any control					
	The sum of all the elements of any row of the transition probability matri					
	(1) 0 (2) 1					
	(3) 2 (4) None of these					
96.	Consider a discrete time Markov chain and					
	Consider a discrete time Markov chain on the state space {1, 2, 3} with					
	0 00 0-7					
	one-step transition probability matrix $\begin{vmatrix} 0 & 0.2 & 0.8 \\ 0.5 & 0 & 0.5 \end{vmatrix}$. Then the period of					
	the Markov chain is					
	(1) 3					
H, some	(2) 2					
*	(3) 1					
97.	Let $\{X_t\}$ and $\{Y_t\}$ be two independent pure birth processes with birth rates λ_1 and λ_2 respectively. Let $Z_t = X_t + Y_t$. Then					
AT STREET	λ_1 and λ_2 respectively. Let $Z_t = X_t + Y_t$. Then					
	(1) $\{Z_t\}$ is not a pure birth process.					
	(2) $\{Z_t\}$ is a pure birth process with birth rate $\lambda_1 + \lambda_2$.					
	(3) $\{Z_t\}$ is a pure birth process with birth rate min (λ_1, λ_2) .					
	(4) $\{Z_i\}$ is a name hint.					
44.	(4) $\{Z_t\}$ is a pure birth process with birth rate $\lambda_1 \lambda_2$.					
98.	Let X and Y be independent					
1	variables uniformly distributed on (0, 4). Then P (X > Y X < 2 Y) is					
((1) 2/3 (2) 5/6					
(3) 1/4 (4) 1/3					
	도 사람이다면 그 보이네요. 그는 모든 것 보게 하는 것이다. 그 모든 그리고 다 가게 되었다.					

Question No.	Questions Questions
99.	If X and Y are independent normal variates with zero expectations and variances σ_1^2 and σ_2^2 , then $Z = \frac{XY}{\sqrt{X^2 + Y^2}}$ is normal with variance
dibw {8	(1) $\sigma_z^2 = \frac{1}{\left(\frac{1}{\sigma_1^2} + \frac{1}{\sigma_2^2}\right)}$ (2) $\sigma_z^2 = \sigma_1^2 + \sigma_2^2$
10 DOM	(3) $\sigma_z^2 = \frac{1}{\sigma_1^2} + \frac{1}{\sigma_2^2}$ (4) None of these
100.	In testing H : μ = 100 against A : μ ≠ 100 at the 10% level of significance, I is rejected if
n rates	(1) 100 is contained in the 90% confidence interval (2) The value of the test statistic is in the acceptance region
	(3) The p-value is less than 0.10
*	(4) The p-value is greater than 0.10
mobne 8L	variables uniformly distributed on (0, 4). Then P (X > Y X < 2 Y
	(1) 2/8 (2) 3/6
	SU Mark of the se Mr. (0)

Set-X. Code-D

	ANSWER KEYS OF	MATHEMATICS FO		23
Q. NO.	A	В	С	D
1_	2	1	3	1
2	4	3	1	3
3	3	2	3	2
4	3	3	4	3
5	1	2	2	2
6	2 .	4	1	4
7	4	1	3	2
8	1.	3	2	3
9	4 ,	2	4	1
10	4 4	1	3	- 1
11	1	3	2	2
12	3 .	1	2	2
13	2 *	1	4	4
14	3 .	4	2	3
15	2	1	2	2
16	4 -	3	1	1
17	2	3	4	3
18	3	2	3	1
19	1	1	2	1
20	1	1	3	2
21	2	1	2	1
22	2	1	4	3
23	4	4	3	2
24	2	4		
			3	3
25	2 .	3	1	2
26	1 .	3	2	4
27	4	2	4	1
28	3 1	4	1	3
29	2	2	4	2
30	3 *	1	4	1
31	11	1	2	3
32	1	3	2	1
33	4	2	4	1
34	4	3	3	4
35	3	2	2	1
36	3	4	1	3
37	2	2	3	3
38	4	3	1	2
39	2	1	1	1
40	1	1	2	1
41	3	2	2	11
42	1	2	1	1
43	3	4	2	4
44	4	3	4	4
45	2	2	3	3
46	1	1	2	3
47	3.	3	1	2
48	2.	1	4	4
49	4:	1	1	2
50	3	2	№ 4	/ 1

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	ANSWER KEYS OF	MATHEMATICS FO	R SESSION 2022-	23
Q. NO.	Α	В	С	D
51	3	2	1	2
52	1 5	1	1	2
53	1 ×	2	4	4
54	4 +	4	4	2
55	1	3	3	2
56	3 *	2	3	1
57	3	1	2	4
58	2	4	4	3
59	1	1	2	2
60	1	4	1	3
61	2	4	1	3
62	1	3	3	1
63	2	3	2	3
64	4 =	2	3	4
65	3	2	2	2
		3	4	1
66	2			3
67	1 (*)	2	1	
68	4	4	3	2
69	1 .	1	2	4
70	4 €	3	1	3
71	1	3	4	2
72	3	1	3	1
73	2	3	3	2
74	3	4	2	4
75	2 ,	2	2	3
76	4 ,	1	3	2
77	1	3	2	1
78	3	2	4	4
79	2	4	1	1
80	1	3	3	4
81	4	2	1	2
82	3	2	3	4
83	3	4	2	3
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85	2	2	2	1
86	3	1	4	2
87	2	4	2	4
88	4	3	3	1
89	1	2	1	4
90	3	3	1	4
91	2	2	3	4
92	2	4	1	3
93	4	3	1	3
93	3	3	4	2
	2	1	1	2
95			3	
96	1	2		3
97	3	4	3	2
98	1	1	2	4
99	1	4	1	1
100	2	4	1	3

S. Ralud 12/2022 Corrage Www.