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PG-EE-July, 2025 (Mathematics)

Sr. No. 10013

Code A

Time : 1¼ Hours **Total Questions : 100** **Max. Marks : 100**

Roll No. _____ (in figure) _____ (in words)

Name : _____ Date of Birth : _____

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1. **All questions are compulsory.**
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 shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.
5. The candidate MUST NOT do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question book-let itself. Answers **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.**
7. Use only Black or Blue **BALL POINT PEN** of good quality in the OMR Answer-Sheet.
8. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

Question No.	Questions
1.	If $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$ is equal to : (1) u (2) $2u$ (3) 1 (4) None of these
2.	$\lim_{x \to 0-} \frac{e^{1/x}-1}{e^{1/x}+1}$ is : (1) -1 (2) 0 (3) 1 (4) None of these
3.	Taylor's Theorem is also known as : (1) Ist mean value theorem of differential equation (2) IInd mean value theorem of differential equation (3) Generalised mean value theorem of differential equation (4) None of these
4.	Equation of evolute of parabola $y^2 = 4ax$ is given by : (1) $27ay^2 = 4(x-2a)^3$ (2) $27ay^2 = 4(x-2a)^2$ (3) $27y^2 = 4(x-2a)^3$ (4) None of these
5.	The length of a loop of the curve $r = a(Q^2 - 1)$ is : (1) $\frac{79}{3}$ (2) $\frac{89}{3}$ (3) $\frac{16}{3}$ (4) None of these

Question No.	Questions
6.	The sum of the eigen values of a matrix is equal to : (1) $\|A\|$ (2) The sum of the elements of the principal diagonal (3) The product of the elements on the principal diagonal (4) None of these
7.	If A is a matrix of order n and A^2 is a null matrix, then what is the maximum possible rank of A : (1) n (2) n^2 (3) n^3 (4) None of these
8.	The eigen values of a nilpotent matrix are : (1) 2 (2) 1 (3) 0 (4) None of these
9.	The quadratic form $9x^2 + y^2 + 4z^2 + 6xy - 12xz - 4yz$ is : (1) Positive definite (2) Positive semi-definite (3) Negative definite (4) Negative semi-definite
10.	Let $x^4 - 3x^3 - 5x^2 + 2x - 1 = 0$ (1) All the roots of equation are real. (2) All the roots of equation are purely imaginary. (3) Two real and the two imaginary roots. (4) None of these

Question No.	Questions
11.	The pole of the line $2x + y + 12 = 0$ w.r.t. circle $x^2 + y^2 - 4x + 3y - 1 = 0$ is : (1) $(1, 3)$ (2) $(2, -2)$ (3) $(1, -2)$ (4) None of these
12.	What is the nature of the curve $13x^2 - 18xy + 37y^2 + 2x + 14y - 2 = 0$ (1) Circle (2) Sphere (3) Ellipse (4) None of these
13.	The latus rectum of the conic $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$ is : (1) 2 (2) 4 (3) 6 (4) 8
14.	The length of the major axis of the ellipse $36x^2 + 24xy + 29y^2 - 180 = 0$ is : (1) 2 (2) 4 (3) 6 (4) None of these
15.	The centre of the conicoid $3x^2 + 6yz - y^2 - z^2 - 6x + 6y - 2z - 2 = 0$ (1) $(1, 0, -1)$ (2) $(2, 0, -2)$ (3) $(3, 0, -3)$ (4) None of these
16.	The highest power of 7 contained in 1000! is : (1) 160 (2) 163 (3) 164 (4) None of these

Question No.	Questions
17.	If $(a, b) = 1$, then (ac, b) is equal to : (1) (a, b) (2) (c, b) (3) 1 (4) None of these
18.	The quadratic residue of 17 are : (1) 1, 2, 4, 8, 9, 13, 15, 16 (2) 1, 3, 5, 7, 9, 14, 16 (3) 1, 2, 4, 6, 8, 9, 13, 15 (4) None of these
19.	The real part of $\sin h\ (x + iy)$ is : (1) $\sin h\ x \cos y$ (2) $\sin x \cos h\ y$ (3) $\cos h\ x \sin y$ (4) None of these
20.	If $\tan^{-1} \frac{2x}{1-x^2} + \cot^{-1} \frac{1-x^2}{2x} = \pi/3$, the value of x is equal to : (1) $3 + \sqrt{2}$ (2) $2 - \sqrt{3}$ (3) $3 - \sqrt{2}$ (4) None of these
21.	The differential equation of first order and first degree is homogeneous if : (1) $\frac{dy}{dx} = \phi(y/x)$ (2) $\frac{dy}{dx} =$ constant (3) $\frac{dy}{dx} = \phi(x)$ (4) None of these
22.	The general solution of the differential equation $e^y \frac{dy}{dx} + (e^y + 1)\cot x = 0$ is : (1) $(e^y + 1)\cos x = K$ (2) $(e^y + 1)\operatorname{cosec} x = K$ (3) $(e^y + 1)\sin x = K$ (4) None of these

Question No.	Questions
23.	What is order and degree of the differential equation $\frac{d^2y}{dx^2} + \sqrt{1 + \left(\frac{d^3y}{dx^3}\right)^4} = 0$ (1) First order, second degree (2) Second order, first degree (3) Second order, second degree (4) None of these
24.	Particular integral of the differential equation $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$ is : (1) $2\log x + 4$ (2) $4\log x - 2$ (3) $4\log x - 4$ (4) None of these
25.	For $a, b, c \in R$, if the differential equation $(ax^2 + b\,xy + y^2)dx + (2x^2 + c\,xy + y^2)dy = 0$ is exact, then : (1) $b = a, c = 20$ (2) $b = 4, c = 2$ (3) $b = 2, c = 2$ (4) None of these
26.	The points whose position vectors are $60\hat{i} + 3\hat{j}$; $40\hat{i} - 8\hat{j}$; $a\hat{i} - 52\hat{j}$ are collinear if : (1) $a = 40$ (2) $a = 20$ (3) $a = -40$ (4) None of these
27.	If ϕ is a scalar point function, then curl (grad ϕ) is equal to : (1) 1 (2) 0 (3) -1 (4) None of these

Question No.	Questions
28.	The value of $\oint_c [(\cos x \sin y - xy)dx + \sin x \cos y \, dy]$, where c is circle $x^2 + y^2 = 1$ is : (1) π (2) $\pi/2$ (3) 1 (4) 0
29.	If $\vec{F} = 3xy \, \hat{i} - y^2 \, \hat{j}$, then the value of $\int_C \vec{F}.d\vec{r}$, where C is the curve in XY-plane, $y = 2x^2$ from $(0,0,)$ to $(1,2)$ is : (1) $\frac{7}{6}$ (2) $\frac{6}{7}$ (3) $\frac{-7}{6}$ (4) None of these
30.	If $\vec{f} = (x + 3y)\,\hat{i} + (y - 2z)\,\hat{j} + (x + az)\,\hat{k}$ is solenoidal, then a is equal to : (1) 1 (2) 2 (3) 0 (4) -2
31.	If $\lim_{x \to 0} \frac{x(1+a\cos x) - b \sin x}{x^3} = 1$ then the values of a and b are : (1) 2, 3 (2) $\frac{5}{2}, \frac{3}{2}$ (3) $\frac{-5}{2}, \frac{-3}{2}$ (4) None of these
32.	If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$ is equal to : (1) $3u$ (2) 3 (3) $\frac{3}{x+y+z}$ (4) None of these

Question No.	Questions
33.	The radius of curvature of helix $x = a\cos t, y = a\sin t, z = at\tan\alpha$ is : (1) $a\sec^2\alpha$ (2) $a\,\text{cosec}^2\alpha$ (3) $a\cot\alpha$ (4) None of these
34.	The point $(0,0)$ for $f(x,y) = x^3 - 3axy + y^3$ is : (1) A maximum point (2) A minimum point (3) A saddle point (4) None of these
35.	The necessary and sufficient condition for the curve to be a plane curve is : (1) $\left[\vec{r}\ \vec{r}'\ \vec{r}''\right] = 0$ (2) $\left[\vec{r}\ \vec{r}''\ \vec{r}'''\right] = 0$ (3) $\left[\vec{r}''\ \vec{r}'''\ \vec{r}^{iv}\right] = 0$ (4) $\left[\vec{r}'\ \vec{r}''\ \vec{r}'''\right] = 0$
36.	A partial differential equation by eliminating the arbitrary function from $z = f(x^2 - y^2)$ is given by : (1) $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ (2) $x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y}$ (3) $y\frac{\partial z}{\partial x} - x\frac{\partial z}{\partial y}$ (4) $y\frac{\partial z}{\partial x} + x\frac{\partial z}{\partial y}$
37.	The partial differential equation $\frac{\partial^2 z}{\partial x^2} + 6\frac{\partial^2 z}{\partial x\,\partial y} + 9\frac{\partial^2 z}{\partial y^2} = 0$ is : (1) Hyperbolic (2) Parabolic (3) Elliptic (4) None of these

Question No.	Questions
38.	The particular integral of the equation $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x\,\partial y} = \sin x \cos 2y$ is : (1) $\sin(x+3y) + \sin(x-3y)$ (2) $\sin(x+2y) + \frac{1}{10}\sin(x-2y)$ (3) $\frac{1}{6}\sin(x+2y) - \frac{1}{10}\sin(x-2y)$ (4) None of these
39.	Two dimensional wave equation is given by : (1) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2}\frac{\partial u}{\partial t}$ (2) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}$ (3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial y} = \frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}$ (4) None of these
40.	The partial differential equation $x\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial y\,\partial x} + y\frac{\partial^2 z}{\partial y^2} + \frac{\partial z}{\partial x} = 0$ is hyperbolic in nature if : (1) $xy < 1$ (2) $xy = 1$ (3) $xy > 1$ (4) None of these
41.	One Joule is equal to : (1) 10^3 ergs (2) 10^5 ergs (3) 10^8 ergs (4) None of these
42.	The magnitude and direction of the resultant of two forces of magnitudes 12 N and 14 N, acting at a point and inclined to each other at an angle of 45° is : (1) $R = 42.3$ N, $\theta = 45°$ (2) $R = 4.2$ N, $\theta = 90°$ (3) $R = 0.45$ N, $\theta = \tan^{-1}(24.03)$ (4) $R = 24.03$ N, $\theta = \tan^{-1}(0.45)$

Question No.	Questions
43.	If ABCD is a square of side 2m. Forces of magnitude 5, 3, 4 and 6 Newtons act along CB, BA, DA and DB respectively. Then the algebraic sum of moments of the forces about vertex C is : (1) $3(1+2\sqrt{2})$ Nm (2) $[3(1-2\sqrt{2})]$ Nm (3) $2(4-3\sqrt{2})$ Nm (4) $2(1+3\sqrt{2})$ Nm
44.	The constant ratio which the limiting friction bears to the normal reaction is called : (1) Limiting friction (2) Angle of friction (3) Cone of friction (4) Co-efficient of friction
45.	The centre of gravity of the area of the position of the parabola $\sqrt{\frac{x}{a}}+\sqrt{\frac{y}{b}}=1$ between the curve and the axes is : (1) $\left(\frac{a}{2},\frac{a}{2}\right)$ (2) $\left(\frac{a}{5},\frac{b}{5}\right)$ (3) $\left(\frac{a}{3},\frac{b}{3}\right)$ (4) None of these
46.	The greatest lower bound of a set, if it exists, is : (1) Two (2) Three (3) Four (4) None of these
47.	The interior of a set A is the largest subset of A, which is : (1) Open (2) Closed (3) Both (4) None of these

Question No.	Questions
48.	The sequence $< n^{1/n} >$ converges to the limit : (1) 0 (2) 1 (3) α (4) None of these
49.	The series $\sum_{n=1}^{\alpha} a_n$, where $a_n = \frac{1}{\sqrt{n}} \sin\frac{1}{n}$ is : (1) Oscillating (2) Divergent (3) Convergent (4) None of these
50.	If $\sum_{n=1}^{\alpha} a_n$ is a series of real numbers whose sequence $< S_n >$ of partial sums is bounded and if $< b_n >$ is a non-negative monotonically decreasing sequence tending to zero, then the series $\sum_{n=1}^{\alpha} a_n b_n$ converges. This statement is known as : (1) Abel's test (2) Abel's lemma (3) Dirichlet's test (4) None of these
51.	The radius of convergence of power series $\sum_{m=0}^{\alpha} \frac{(-1)^m}{5^m}(x+1)^{3m}$ is : (1) $5^{1/5}$ (2) $5^{1/3}$ (3) 5 (4) None of these
52.	The value of $H_{2n}(0)$ is : (1) $(-1)^n \frac{(2n)!}{n!}$ (2) $(-1)^n \frac{(2n-1)!}{(n-1)!}$ (3) $\frac{(2n)!}{n!}$ (4) None of these

Question No.	Questions
53.	The value of $L^{-1}\left(\frac{s}{4s^2+15}\right)$ is : (1) $\frac{1}{2}\sin\frac{\sqrt{15}}{2}t$ (2) $\frac{1}{4}\cos\frac{\sqrt{15}}{2}t$ (3) $\frac{1}{4}\tan\frac{\sqrt{15}}{2}t$ (4) None of these
54.	The finite sine transform of $f(x) = 2x$, where $0 < x < 4$, is equal to (1) $\frac{16}{n\pi}$ (2) $\frac{32}{n\pi}$ (3) $\frac{-32}{n\pi}(-1)^n$ (4) None of these
55.	The Fourier cosine transform of $f(x) = \begin{cases}1, & 0 \le x < 1\\ 0, & x > 1\end{cases}$ is equal to : (1) $\frac{\sin s}{s}$ (2) $\frac{\cos s}{s}$ (3) $\frac{\sec s}{s}$ (4) None of these
56.	C programming language was developed by : (1) Bill Gates (2) Ken Thompson (3) Dennis Ritchie (4) None of these
57.	Which of the following key word is used for the storage class? (1) print f (2) external (3) auto (4) scan f

Question No.	Questions
58.	The bitwise AND operator is used for : (1) Masking (2) Comparison (3) Division (4) Shifting bits
59.	Which of the following statements is true? (1) C library functions provide I/O facilities (2) C inherent I/O facilities (3) C does not have I/O facilities (4) Both (1) and (3)
60.	Which of the following variable names is NOT valid? (1) go-cart (2) go 4 it (3) 4 reason (4) run 4
61.	If f is integrable on $[0,1]$, then $\int_0^1 f(x)\,dx$ is equal to : (1) $\lim_{n\to\alpha} \sum_{r=1}^{n} f\left(\frac{r}{n}\right)$ (2) $\lim_{n\to\alpha} \frac{1}{n} \sum_{r=1}^{n} f\left(\frac{r}{n}\right)$ (3) $\lim_{n\to\alpha} \sum_{r=1}^{n} f\left(\frac{n}{r}\right).r$ (4) None of these
62.	The improper integral $\int_0^1 \frac{dx}{x^2-3x+2}$ is : (1) Convergent (2) Oscillating (3) Divergent (4) None of these

Question No.	Questions
63.	Which one is not a complete metric space : (1) The usual metric space (R,d) (2) The space of complex numbers (3) Any discrete metric space (4) None of these
64.	Energy complete metric space is of the second category as a subset of itself is the statement of (1) Banach's fixed point theorem (2) Baire's category theorem (3) Cantor's intersection theorem (4) None of these
65.	If $f(x) = x$, $x \in [0,1]$ and $P = \left\{0; \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1\right\}$ be the partition of [0,1], then $L(f, P)$ is equal to : (1) $^{8}/_{26}$ (2) $\frac{7}{16}$ (3) $^{13}/_{36}$ (4) none of these
66.	Which one is not a compact subset? (1) Any finite subset of a metric space (2) A = [–50, 50] of R (3) Set $\left\{\frac{1}{n} : n \in N\right\} \cup \{0\}$ in R (4) Usual metric space (R, d)

Question No.	Questions
67.	Which one is a dense set? (1) Q in R (2) Set of natural numbers in R (3) The subset $A = \left\{\frac{1}{n},\ n \in N\right\}$ in R (4) None of these
68.	The number of non-isomorphic abelian groups of order 8 is : (1) 1 (2) 2 (3) 3 (4) none of these
69.	Number of Sylow 2-subgroups of S_3 is : (1) 2 (2) 3 (3) 6 (4) None of these
70.	Energy subgroup of a finite cyclic group is : (1) Characteristic subgroup (2) Normal subgroup (3) Cyclic subgroup (4) None of these
71.	If a be any integer and p be any prime number, then $a^p \equiv a \bmod p$ is the statement of : (1) Fermat's theorem (2) Wilson theorem (3) Lagrange's theorem (4) None of these

Question No.	Questions
72.	An ideal of a ring of integers is maximal iff it is generated by some..... (1) Natural number (2) Prime integer (3) Real number (4) None of these
73.	Let f be a ring isomorphism of R onto R′. If R′ is an integral domain. then R is (1) Not an integral domain (2) An integral domain (3) Both (1) and (2) (4) None of these
74.	If 'a' is an irreducible element of a unique factorization domain R, then 'a' must be ..... (1) Natural number (2) Real number (3) Prime number (4) None of these
75.	The order of convergence of Regula Falsi Method is : (1) 1 (2) 1.618 (3) 2 (4) none of these
76.	$\Delta f(x)\, g(x)$ is equal to : (1) $f(x)\,\Delta g(x) + g(x)\,\Delta f(x)$ (2) $f(x+h)\,\Delta g(x) + g(x)\,\nabla f(x)$ (3) $f(x+h)\,\Delta g(x) + g(x)\,\Delta f(x)$ (4) None of these
77.	$\mu - \frac{\delta}{2}$ is equal to : (1) $E^{1/2}$ (2) E (3) E^{-1} (4) $E^{-1/2}$

Question No.	Questions
78.	Runge-Kutta method is used for : (1) Interpolation (2) Numerical differentiation (3) Numerical Integration (4) Numerical solution of ordinary differention equation
79.	Milne-Simpron's method is a : (1) Multiple step method (2) Single step method (3) Both (1) and (2) (4) None of these
80.	Which of the following is also known as method of false position? (1) Bisection method (2) Newton Raphson method (3) Regula-falsi method (4) None of these
81.	If T is one–one linear transformation, then dim Ker T is : (1) 0 (2) 1 (3) 2 (4) None of these
82.	The linear transformation $T : R^2 \to R^2$ defined by $T(1, 0) = (2, 3)$, $T(0, 1) = (5, 6)$ is : (1) One-one and onto (2) One-one but not onto (3) Onto but not one-one (4) None of these

Question No.	Questions
83.	Let R be the field of real numbers. Which of the following is not a sub-space of $V_3(R)$: (1) $\{(x, 2y, 3z) : x, y, z \in R\}$ (2) $\{(x, x, x) : x \in R\}$ (3) $\{(x, y, z) : x, y, z$ are rational number$\}$ (4) None of these
84.	If W is a subspace of $V = V_3(R)$ generated by $\{(1,0,0),(1,1,0)\}$. Then basis of V/W is : (1) $\{W + (0,8,8)\}$ (2) $\{W + (0,0,1)\}$ (3) $\{W + (a,0,a) : a \in R\}$ (4) None of these
85.	Let the linear transformation $T_1 : R^2 \to R^2$ such that $T_1(x,y) = (0,4x)$ and $T_2 : R^2 \to R^2$ such that $T_2(x,y) = (x,0)$. Then $T_1T_2(x,y)$ is equal to : (1) $(0,6x)$ (2) $(3x,y)$ (3) $(0,0)$ (4) $(0,4x)$
86.	Let $T : U \to V$ be a homomorphism, then Ker T is a subspace of : (1) V (2) U (3) $T(U)$ (4) None of these
87.	Let u, v be normal vectors in an inner product space V s.t. $\|u + v\| = 1$. Then $\|u - v\|$ is : (1) $\sqrt{3}$ (2) 1 (3) $\sqrt{2}$ (4) None of these

Question No.	Questions
88.	The radial and transverse components of velocity of a particle moving along a plane curve $r = f(\theta)$ are : (1) $\frac{d^2y}{dt^2}, r\frac{d^2\theta}{dt^2}$ (2) $\frac{dr}{dt}, \left(\frac{d\theta}{dt}\right)^2$ (3) $\frac{d\theta}{dt}, r^2\frac{d\theta}{dt}$ (4) $\frac{dr}{dt}, r\frac{d\theta}{dt}$
89.	A particle of mass 2 grammes is moving with a S.H.M. If its maximum velocity is 2π cm/sec. and the amplitude of the vibration is 20 cm., then the period of vibration is : (1) 5 seconds (2) 10 seconds (3) 20 seconds (4) None of these
90.	A particle is projected with a velocity of 24.5 m/sec. in a direction making an angle 60° with the horizontal. Then the greatest height attained by the particle is : (1) 22.96 m (2) 11.96 m (3) 36.84 m (4) None of these
91.	A Car weighing 250 kg travelling at 19.6 m/sec. is brought to rest in 4.9 m by application of brakes. Then the force of resistance of brakes is : (1) 7800 Newtons (2) 8800 Newtons (3) 9800 Newtons (4) None of these

Question No.	Questions
92.	The central force is defined as : (1) A force whose line of action always passes through a fixed point (2) A force whose line of action does not pass through a fixed point (3) A force whose line of action always passes through variable point (4) None of these
93.	Polar equation of ellipse referred to focus as pole is : (1) $\frac{l}{r} = 1 + e\cos\theta$ (2) $\frac{l}{r} = 1 - e\cos\theta$ (3) $\frac{l}{r} = e\cos\theta - 1$ (4) None of these
94.	If $r = \sqrt{x^2+y^2}$, $\theta = \tan^{-1}(y/x)$, then $\frac{\partial(r,\theta)}{\partial(x,y)}$ is : (1) $\frac{x}{x^2+y^2}$ (2) $\frac{y}{x^2+y^2}$ (3) $\frac{1}{x^2+y^2}$ (4) $\frac{1}{\sqrt{x^2+y^2}}$
95.	$\int_0^{\alpha} e^{-x^2}dx$ is equal to : (1) $\pi/4$ (2) $\sqrt{\pi}/4$ (3) $\sqrt{\pi}/2$ (4) None of these
96.	The Fourier co-efficient a_n for the function $f(x) = x$ in $[-\pi, \pi]$ is : (1) 1 (2) 0 (3) $-1/2$ (4) None of these

Question No.	Questions
97.	Polar form of C-R equations are : (1) $\frac{\partial u}{\partial \theta} = \frac{1}{r}\frac{\partial v}{\partial r}$, $\frac{\partial v}{\partial r} = r\frac{\partial v}{\partial \theta}$ (2) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$, $\frac{\partial v}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$ (3) $\frac{\partial u}{\partial r} = r\frac{\partial v}{\partial \theta}$, $\frac{\partial u}{\partial \theta} = -r\frac{\partial v}{\partial r}$ (4) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$, $\frac{\partial u}{\partial \theta} = -r\frac{\partial v}{\partial r}$
98.	The function $f(z) = r^2 \cos 2\theta + ir^2 \sin k\theta$ is analytic then the value of k is equal to : (1) 0 (2) 2 (3) 4 (4) None of these
99.	The point on the Complex plane corresponding to the point $\left(\frac{1}{3}, \frac{2}{3}, \frac{2}{3}\right)$ on the Riemann sphere $X^2 + Y^2 + Z^2 = 1$ is : (1) $1 + 2i$ (2) $3 + 2i$ (3) $4 + 3i$ (4) None of these
100.	The angle of rotation at $z = 2 + i$ for the transformation $w = z^2$ is equal to : (1) $\tan^{-1} 1/3$ (2) $\tan^{-1} 1/2$ (3) $\tan^{-1} 2$ (4) None of these

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PG-EE-July, 2025 (Mathematics)

Sr. No. 10002

Code B

Time : 1¼ Hours **Total Questions : 100** **Max. Marks : 100**

Roll No. _____ (in figure)_____ (in words)

Name : _____ Date of Birth : _____

Father's Name : _____ Mother's Name : _____

Date of Examination : _____

(Signature of the candidate) (Signature of the Invigilator)

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

1. **All questions are compulsory.**
2. The candidates must return the Question 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 shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.
5. The candidate MUST NOT do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question book-let itself. Answers **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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Question No.	Questions
1.	The pole of the line $2x + y + 12 = 0$ w.r.t. circle $x^2 + y^2 - 4x + 3y - 1 = 0$ is : (1) $(1, 3)$ (2) $(2, -2)$ (3) $(1, -2)$ (4) None of these
2.	What is the nature of the curve $13x^2 - 18xy + 37y^2 + 2x + 14y - 2 = 0$ (1) Circle (2) Sphere (3) Ellipse (4) None of these
3.	The latus rectum of the conic $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$ is : (1) 2 (2) 4 (3) 6 (4) 8
4.	The length of the major axis of the ellipse $36x^2 + 24xy + 29y^2 - 180 = 0$ is : (1) 2 (2) 4 (3) 6 (4) None of these
5.	The centre of the conicoid $3x^2 + 6yz - y^2 - z^2 - 6x + 6y - 2z - 2 = 0$ (1) $(1, 0, -1)$ (2) $(2, 0, -2)$ (3) $(3, 0, -3)$ (4) None of these
6.	The highest power of 7 contained in 1000! is : (1) 160 (2) 163 (3) 164 (4) None of these

Question No.	Questions
7.	If $(a, b) = 1$, then (ac, b) is equal to : (1) (a, b) (2) (c, b) (3) 1 (4) None of these
8.	The quadratic residue of 17 are : (1) 1, 2, 4, 8, 9, 13, 15, 16 (2) 1, 3, 5, 7, 9, 14, 16 (3) 1, 2, 4, 6, 8, 9, 13, 15 (4) None of these
9.	The real part of $\sin h\ (x + iy)$ is : (1) $\sin h\ x \cos y$ (2) $\sin x \cos h\ y$ (3) $\cos h\ x \sin y$ (4) None of these
10.	If $\tan^{-1} \frac{2x}{1-x^2} + \cot^{-1} \frac{1-x^2}{2x} = \pi/3$, the value of x is equal to : (1) $3 + \sqrt{2}$ (2) $2 - \sqrt{3}$ (3) $3 - \sqrt{2}$ (4) None of these
11.	A Car weighing 250 kg travelling at 19.6 m/sec. is brought to rest in 4.9 m by application of brakes. Then the force of resistance of brakes is : (1) 7800 Newtons (2) 8800 Newtons (3) 9800 Newtons (4) None of these
12.	The central force is defined as : (1) A force whose line of action always passes through a fixed point (2) A force whose line of action does not pass through a fixed point (3) A force whose line of action always passes through variable point (4) None of these

Question No.	Questions
13.	Polar equation of ellipse referred to focus as pole is : (1) $\frac{l}{r} = 1 + e\cos\theta$ (2) $\frac{l}{r} = 1 - e\cos\theta$ (3) $\frac{l}{r} = e\cos\theta - 1$ (4) None of these
14.	If $r = \sqrt{x^2+y^2}$, $\theta = \tan^{-1}(y/x)$, then $\frac{\partial(r,\theta)}{\partial(x,y)}$ is : (1) $\frac{x}{x^2+y^2}$ (2) $\frac{y}{x^2+y^2}$ (3) $\frac{1}{x^2+y^2}$ (4) $\frac{1}{\sqrt{x^2+y^2}}$
15.	$\int_0^{\alpha} e^{-x^2}dx$ is equal to : (1) $\pi/4$ (2) $\sqrt{\pi}/4$ (3) $\sqrt{\pi}/2$ (4) None of these
16.	The Fourier co-efficient a_n for the function $f(x) = x$ in $[-\pi, \pi]$ is : (1) 1 (2) 0 (3) $-1/2$ (4) None of these
17.	Polar form of C-R equations are : (1) $\frac{\partial u}{\partial\theta} = \frac{1}{r}\frac{\partial v}{\partial r}$, $\frac{\partial v}{\partial r} = r\frac{\partial v}{\partial\theta}$ (2) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial\theta}$, $\frac{\partial v}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial\theta}$ (3) $\frac{\partial u}{\partial r} = r\frac{\partial v}{\partial\theta}$, $\frac{\partial u}{\partial\theta} = -r\frac{\partial v}{\partial r}$ (4) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial\theta}$, $\frac{\partial u}{\partial\theta} = -r\frac{\partial v}{\partial r}$

Question No.	Questions
18.	The function $f(z) = r^2 \cos 2\theta + ir^2 \sin k\theta$ is analytic then the value of k is equal to : (1) 0 (2) 2 (3) 4 (4) None of these
19.	The point on the Complex plane corresponding to the point $\left(\frac{1}{3}, \frac{2}{3}, \frac{2}{3}\right)$ on the Riemann sphere $X^2 + Y^2 + Z^2 = 1$ is : (1) $1 + 2i$ (2) $3 + 2i$ (3) $4 + 3i$ (4) None of these
20.	The angle of rotation at $z = 2 + i$ for the transformation $w = z^2$ is equal to : (1) $\tan^{-1} 1/3$ (2) $\tan^{-1} 1/2$ (3) $\tan^{-1} 2$ (4) None of these
21.	If a be any integer and p be any prime number, then $a^p \equiv a \bmod p$ is the statement of : (1) Fermat's theorem (2) Wilson theorem (3) Lagrange's theorem (4) None of these
22.	An ideal of a ring of integers is maximal iff it is generated by some..... (1) Natural number (2) Prime integer (3) Real number (4) None of these

Question No.	Questions
23.	Let f be a ring isomorphism of R onto R′. If R′ is an integral domain, then R is (1) Not an integral domain (2) An integral domain (3) Both (1) and (2) (4) None of these
24.	If 'a' is an irreducible element of a unique factorization domain R, then 'a' must be ..... (1) Natural number (2) Real number (3) Prime number (4) None of these
25.	The order of convergence of Regula Falsi Method is : (1) 1 (2) 1.618 (3) 2 (4) none of these
26.	$\Delta f(x)\, g(x)$ is equal to : (1) $f(x)\,\Delta\, g(x) + g(x)\,\Delta f(x)$ (2) $f(x+h)\,\Delta\, g(x) + g(x)\,\nabla\, f(x)$ (3) $f(x+h)\,\Delta\, g(x) + g(x)\,\Delta\, f(x)$ (4) None of these
27.	$\mu - \frac{\delta}{2}$ is equal to : (1) $E^{1/2}$ (2) E (3) E^{-1} (4) $E^{-1/2}$
28.	Runge-Kutta method is used for : (1) Interpolation (2) Numerical differentiation (3) Numerical Integration (4) Numerical solution of ordinary differention equation

Question No.	Questions
29.	Milne-Simpron's method is a : (1) Multiple step method (2) Single step method (3) Both (1) and (2) (4) None of these
30.	Which of the following is also known as method of false position? (1) Bisection method (2) Newton Raphson method (3) Regula-falsi method (4) None of these
31.	The radius of convergence of power series $\sum_{m=0}^{\alpha} \frac{(-1)^m}{5^m}(x+1)^{3m}$ is : (1) $5^{1/5}$ (2) $5^{1/3}$ (3) 5 (4) None of these
32.	The value of $H_{2n}(0)$ is : (1) $(-1)^n \frac{(2n)!}{n!}$ (2) $(-1)^n \frac{(2n-1)!}{(n-1)!}$ (3) $\frac{(2n)!}{n!}$ (4) None of these
33.	The value of $L^{-1}\left(\frac{s}{4s^2+15}\right)$ is : (1) $\frac{1}{2}\sin\frac{\sqrt{15}}{2}t$ (2) $\frac{1}{4}\cos\frac{\sqrt{15}}{2}t$ (3) $\frac{1}{4}\tan\frac{\sqrt{15}}{2}t$ (4) None of these
34.	The finite sine transform of $f(x) = 2x$, where $0 < x < 4$, is equal to (1) $\frac{16}{n\pi}$ (2) $\frac{32}{n\pi}$ (3) $\frac{-32}{n\pi}(-1)^n$ (4) None of these

Question No.	Questions
35.	The Fourier cosine transform of $f(x) = \begin{cases} 1, & 0 \le x < 1 \\ 0, & x > 1 \end{cases}$ is equal to : (1) $\frac{\sin s}{s}$ (2) $\frac{\cos s}{s}$ (3) $\frac{\sec s}{s}$ (4) None of these
36.	C programming language was developed by : (1) Bill Gates (2) Ken Thompson (3) Dennis Ritchie (4) None of these
37.	Which of the following key word is used for the storage class? (1) print f (2) external (3) auto (4) scan f
38.	The bitwise AND operator is used for : (1) Masking (2) Comparison (3) Division (4) Shifting bits
39.	Which of the following statements is true? (1) C library functions provide I/O facilities (2) C inherent I/O facilities (3) C does not have I/O facilities (4) Both (1) and (3)
40.	Which of the following variable names is NOT valid? (1) go-cart (2) go 4 it (3) 4 reason (4) run 4

Question No.	Questions
41.	If $\lim_{x\to 0}\frac{x(1+a\cos x)-b\sin x}{x^3}=1$ then the values of a and b are : (1) $2,3$ (2) $\frac{5}{2},\frac{3}{2}$ (3) $\frac{-5}{2},\frac{-3}{2}$ (4) None of these
42.	If $u=\log(x^3+y^3+z^3-3xyz)$, then $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}$ is equal to : (1) $3u$ (2) 3 (3) $\frac{3}{x+y+z}$ (4) None of these
43.	The radius of curvature of helix $x=a\cos t, y=a\sin t, z=at\tan\alpha$ is : (1) $a\sec^2\alpha$ (2) $a\operatorname{cosec}^2\alpha$ (3) $a\cot\alpha$ (4) None of these
44.	The point $(0,0)$ for $f(x,y)=x^3-3axy+y^3$ is : (1) A maximum point (2) A minimum point (3) A saddle point (4) None of these
45.	The necessary and sufficient condition for the curve to be a plane curve is : (1) $[\vec{r}\ \vec{r}'\ \vec{r}'']=0$ (2) $[\vec{r}\ \vec{r}''\ \vec{r}''']=0$ (3) $[\vec{r}''\ \vec{r}'''\ \vec{r}^{iv}]=0$ (4) $[\vec{r}'\ \vec{r}''\ \vec{r}''']=0$
46.	A partial differential equation by eliminating the arbitrary function from $z=f(x^2-y^2)$ is given by : (1) $x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}$ (2) $x\frac{\partial z}{\partial x}-y\frac{\partial z}{\partial y}$ (3) $y\frac{\partial z}{\partial x}-x\frac{\partial z}{\partial y}$ (4) $y\frac{\partial z}{\partial x}+x\frac{\partial z}{\partial y}$

Question No.	Questions
47.	The partial differential equation $\frac{\partial^2 z}{\partial x^2} + 6\frac{\partial^2 z}{\partial x\,\partial y} + 9\frac{\partial^2 z}{\partial y^2} = 0$ is : (1) Hyperbolic (2) Parabolic (3) Elliptic (4) None of these
48.	The particular integral of the equation $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x\,\partial y} = \sin x \cos 2y$ is : (1) $\sin(x+3y) + \sin(x-3y)$ (2) $\sin(x+2y) + \frac{1}{10}\sin(x-2y)$ (3) $\frac{1}{6}\sin(x+2y) - \frac{1}{10}\sin(x-2y)$ (4) None of these
49.	Two dimensional wave equation is given by : (1) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2}\frac{\partial u}{\partial t}$ (2) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}$ (3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial y} = \frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}$ (4) None of these
50.	The partial differential equation $x\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial y\,\partial x} + y\frac{\partial^2 z}{\partial y^2} + \frac{\partial z}{\partial x} = 0$ is hyperbolic in nature if : (1) $xy < 1$ (2) $xy = 1$ (3) $xy > 1$ (4) None of these
51.	The differential equation of first order and first degree is homogeneous if : (1) $\frac{dy}{dx} = \phi(y/x)$ (2) $\frac{dy}{dx} =$ constant (3) $\frac{dy}{dx} = \phi(x)$ (4) None of these

Question No.	Questions
52.	The general solution of the differential equation $e^y \frac{dy}{dx} + (e^y + 1)\cot x = 0$ is : (1) $(e^y + 1)\cos x = K$ (2) $(e^y + 1)\operatorname{cosec} x = K$ (3) $(e^y + 1)\sin x = K$ (4) None of these
53.	What is order and degree of the differential equation $\frac{d^2y}{dx^2} + \sqrt{1 + \left(\frac{d^3y}{dx^3}\right)^4} = 0$ (1) First order, second degree (2) Second order, first degree (3) Second order, second degree (4) None of these
54.	Particular integral of the differential equation $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$ is : (1) $2\log x + 4$ (2) $4\log x - 2$ (3) $4\log x - 4$ (4) None of these
55.	For $a, b, c \in R$, if the differential equation $(ax^2 + b\,xy + y^2)dx + (2x^2 + c\,xy + y^2)dy = 0$ is exact, then : (1) $b = a, c = 20$ (2) $b = 4, c = 2$ (3) $b = 2, c = 2$ (4) None of these
56.	The points whose position vectors are $60\hat{i} + 3\hat{j}$; $40\hat{i} - 8\hat{j}$; $a\hat{i} - 52\hat{j}$ are collinear if : (1) $a = 40$ (2) $a = 20$ (3) $a = -40$ (4) None of these

Question No.	Questions
57.	If ϕ is a scalar point function, then curl (grad ϕ) is equal to : (1) 1 (2) 0 (3) -1 (4) None of these
58.	The value of $\oint_c [(\cos x \sin y - xy)dx + \sin x \cos y \, dy]$, where c is circle $x^2 + y^2 = 1$ is : (1) π (2) $\pi/2$ (3) 1 (4) 0
59.	If $\vec{F} = 3xy \, \hat{i} - y^2 \, \hat{j}$, then the value of $\int_C \vec{F}.d\vec{r}$, where C is the curve in XY-plane, $y = 2x^2$ from $(0, 0,)$ to $(1, 2)$ is : (1) $\frac{7}{6}$ (2) $\frac{6}{7}$ (3) $\frac{-7}{6}$ (4) None of these
60.	If $\vec{f} = (x + 3y)\hat{i} + (y - 2z)\hat{j} + (x + az)\hat{k}$ is solenoidal, then a is equal to : (1) 1 (2) 2 (3) 0 (4) -2
61.	One Joule is equal to : (1) 10^3 ergs (2) 10^5 ergs (3) 10^8 ergs (4) None of these

Question No.	Questions
62.	The magnitude and direction of the resultant of two forces of magnitudes 12 N and 14 N, acting at a point and inclined to each other at an angle of 45° is : (1) $R = 42.3$ N, $\theta = 45°$ (2) $R = 4.2$ N, $\theta = 90°$ (3) $R = 0.45$ N, $\theta = \tan^{-1}(24.03)$ (4) $R = 24.03$ N, $\theta = \tan^{-1}(0.45)$
63.	If ABCD is a square of side 2m. Forces of magnitude 5, 3, 4 and 6 Newtons act along CB, BA, DA and DB respectively. Then the algebraic sum of moments of the forces about vertex C is : (1) $3(1+2\sqrt{2})$ Nm (2) $[3(1-2\sqrt{2})]$ Nm (3) $2(4-3\sqrt{2})$ Nm (4) $2(1+3\sqrt{2})$ Nm
64.	The constant ratio which the limiting friction bears to the normal reaction is called : (1) Limiting friction (2) Angle of friction (3) Cone of friction (4) Co-efficient of friction
65.	The centre of gravity of the area of the position of the parabola $\sqrt{\frac{x}{a}} + \sqrt{\frac{y}{b}} = 1$ between the curve and the axes is : (1) $\left(\frac{a}{2}, \frac{a}{2}\right)$ (2) $\left(\frac{a}{5}, \frac{b}{5}\right)$ (3) $\left(\frac{a}{3}, \frac{b}{3}\right)$ (4) None of these

Question No.	Questions
66.	The greatest lower bound of a set, if it exists, is : (1) Two (2) Three (3) Four (4) None of these
67.	The interior of a set A is the largest subset of A, which is : (1) Open (2) Closed (3) Both (4) None of these
68.	The sequence $< n^{1/n} >$ converges to the limit : (1) 0 (2) 1 (3) α (4) None of these
69.	The series $\sum_{n=1}^{\alpha} a_n$, where $a_n = \frac{1}{\sqrt{n}} \sin\frac{1}{n}$ is : (1) Oscillating (2) Divergent (3) Convergent (4) None of these
70.	If $\sum_{n=1}^{\alpha} a_n$ is a series of real numbers whose sequence $< S_n >$ of partial sums is bounded and if $< b_n >$ is a non-negative monotonically decreasing sequence tending to zero, then the series $\sum_{n=1}^{\alpha} a_n b_n$ converges. This statement is known as : (1) Abel's test (2) Abel's lemma (3) Dirichlet's test (4) None of these

Question No.	Questions
71.	If f is integrable on [0,1], then $\int_0^1 f(x)\,dx$ is equal to : (1) $\lim_{n\to\alpha} \sum_{r=1}^{n} f\left(\frac{r}{n}\right)$ (2) $\lim_{n\to\alpha} \frac{1}{n} \sum_{r=1}^{n} f\left(\frac{r}{n}\right)$ (3) $\lim_{n\to\alpha} \sum_{r=1}^{n} f\left(\frac{n}{r}\right).r$ (4) None of these
72.	The improper integral $\int_0^1 \frac{dx}{x^2-3x+2}$ is : (1) Convergent (2) Oscillating (3) Divergent (4) None of these
73.	Which one is not a complete metric space : (1) The usual metric space (R,d) (2) The space of complex numbers (3) Any discrete metric space (4) None of these
74.	Energy complete metric space is of the second category as a subset of itself is the statement of (1) Banach's fixed point theorem (2) Baire's category theorem (3) Cantor's intersection theorem (4) None of these

Question No.	Questions
75.	If $f(x) = x$, $x \in [0,1]$ and $P = \left\{0, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1\right\}$ be the partition of [0,1], then $L(f, P)$ is equal to : (1) $^{8}/_{26}$ (2) $\frac{7}{16}$ (3) $^{13}/_{36}$ (4) none of these
76.	Which one is not a compact subset? (1) Any finite subset of a metric space (2) A = [–50, 50] of R (3) Set $\left\{\frac{1}{n} : n \in N\right\} \cup \{0\}$ in R (4) Usual metric space (R, d)
77.	Which one is a dense set? (1) Q in R (2) Set of natural numbers in R (3) The subset A = $\left\{\frac{1}{n}, n \in N\right\}$ in R (4) None of these
78.	The number of non-isomorphic abelian groups of order 8 is : (1) 1 (2) 2 (3) 3 (4) none of these

Question No.	Questions
79.	Number of Sylow 2-subgroups of S_3 is : (1) 2 (2) 3 (3) 6 (4) None of these
80.	Energy subgroup of a finite cyclic group is : (1) Characteristic subgroup (2) Normal subgroup (3) Cyclic subgroup (4) None of these
81.	If $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$ is equal to : (1) u (2) $2u$ (3) 1 (4) None of these
82.	$\lim_{x \to 0-} \frac{e^{1/x}-1}{e^{1/x}+1}$ is : (1) -1 (2) 0 (3) 1 (4) None of these
83.	Taylor's Theorem is also known as : (1) Ist mean value theorem of differential equation (2) IInd mean value theorem of differential equation (3) Generalised mean value theorem of differential equation (4) None of these

Question No.	Questions
84.	Equation of evolute of parabola $y^2 = 4ax$ is given by : (1) $27ay^2 = 4(x-2a)^3$ (2) $27ay^2 = 4(x-2a)^2$ (3) $27y^2 = 4(x-2a)^3$ (4) None of these
85.	The length of a loop of the curve $r = a(Q^2 - 1)$ is : (1) $\frac{79}{3}$ (2) $\frac{89}{3}$ (3) $\frac{16}{3}$ (4) None of these
86.	The sum of the eigen values of a matrix is equal to : (1) $\|A\|$ (2) The sum of the elements of the principal diagonal (3) The product of the elements on the principal diagonal (4) None of these
87.	If A is a matrix of order n and A^2 is a null matrix, then what is the maximum possible rank of A : (1) n (2) n^2 (3) n^3 (4) None of these
88.	The eigen values of a nilpotent matrix are : (1) 2 (2) 1 (3) 0 (4) None of these

Question No.	Questions
89.	The quadratic form $9x^2 + y^2 + 4z^2 + 6xy - 12xz - 4yz$ is : (1) Positive definite (2) Positive semi-definite (3) Negative definite (4) Negative semi-definite
90.	Let $x^4 - 3x^3 - 5x^2 + 2x - 1 = 0$ (1) All the roots of equation are real. (2) All the roots of equation are purely imaginary. (3) Two real and the two imaginary roots. (4) None of these
91.	If T is one–one linear transformation, then dim Ker T is : (1) 0 (2) 1 (3) 2 (4) None of these
92.	The linear transformation $T : R^2 \to R^2$ defined by $T(1, 0) = (2, 3)$, $T(0, 1) = (5, 6)$ is : (1) One-one and onto (2) One-one but not onto (3) Onto but not one-one (4) None of these
93.	Let R be the field of real numbers. Which of the following is not a sub-space of $V_3(R)$: (1) $\{(x, 2y, 3z) : x, y, z \in R\}$ (2) $\{(x, x, x) : x \in R\}$ (3) $\{(x, y, z) : x, y, z$ are rational number$\}$ (4) None of these

Question No.	Questions
94.	If W is a subspace of $V = V_3(R)$ generated by $\{(1,0,0),(1,1,0)\}$. Then basis of V/W is : (1) $\{W + (0,8,8)\}$ (2) $\{W + (0,0,1)\}$ (3) $\{W + (a,0,a) : a \in R\}$ (4) None of these
95.	Let the linear transformation $T_1 : R^2 \to R^2$ such that $T_1(x,y) = (0,4x)$ and $T_2 : R^2 \to R^2$ such that $T_2(x,y) = (x,0)$. Then $T_1T_2(x,y)$ is equal to : (1) $(0,6x)$ (2) $(3x,y)$ (3) $(0,0)$ (4) $(0,4x)$
96.	Let $T : U \to V$ be a homomorphism, then Ker T is a subspace of : (1) V (2) U (3) $T(U)$ (4) None of these
97.	Let u, v be normal vectors in an inner product space V s.t. $\|u + v\| = 1$. Then $\|u - v\|$ is : (1) $\sqrt{3}$ (2) 1 (3) $\sqrt{2}$ (4) None of these
98.	The radial and transverse components of velocity of a particle moving along a plane curve $r = f(\theta)$ are : (1) $\frac{d^2y}{dt^2}, r\frac{d^2\theta}{dt^2}$ (2) $\frac{dr}{dt}, \left(\frac{d\theta}{dt}\right)^2$ (3) $\frac{d\theta}{dt}, r^2\frac{d\theta}{dt}$ (4) $\frac{dr}{dt}, r\frac{d\theta}{dt}$

Question No.	Questions
99.	A particle of mass 2 grammes is moving with a S.H.M. If its maximum velocity is 2π cm/sec. and the amplitude of the vibration is 20 cm., then the period of vibration is : (1) 5 seconds (2) 10 seconds (3) 20 seconds (4) None of these
100.	A particle is projected with a velocity of 24.5 m/sec. in a direction making an angle 60° with the horizontal. Then the greatest height attained by the particle is : (1) 22.96 m (2) 11.96 m (3) 36.84 m (4) None of these

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PG-EE-July, 2025 (Mathematics)

10011

Sr. No._____

Code **C**

Time : 1¼ Hours **Total Questions : 100** **Max. Marks : 100**

Roll No. _____ (in figure)_____ (in words)

Name : _____ Date of Birth : _____

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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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Question No.	Questions
1.	One Joule is equal to : (1) 10^3 ergs (2) 10^5 ergs (3) 10^8 ergs (4) None of these
2.	The magnitude and direction of the resultant of two forces of magnitudes 12 N and 14 N, acting at a point and inclined to each other at an angle of 45° is : (1) $R = 42.3$ N, $\theta = 45°$ (2) $R = 4.2$ N, $\theta = 90°$ (3) $R = 0.45$ N, $\theta = \tan^{-1}(24.03)$ (4) $R = 24.03$ N, $\theta = \tan^{-1}(0.45)$
3.	If ABCD is a square of side 2m. Forces of magnitude 5, 3, 4 and 6 Newtons act along CB, BA, DA and DB respectively. Then the algebraic sum of moments of the forces about vertex C is : (1) $3(1+2\sqrt{2})$ Nm (2) $[3(1-2\sqrt{2})]$ Nm (3) $2(4-3\sqrt{2})$ Nm (4) $2(1+3\sqrt{2})$ Nm
4.	The constant ratio which the limiting friction bears to the normal reaction is called : (1) Limiting friction (2) Angle of friction (3) Cone of friction (4) Co-efficient of friction
5.	The centre of gravity of the area of the position of the parabola $\sqrt{\frac{x}{a}} + \sqrt{\frac{y}{b}} = 1$ between the curve and the axes is : (1) $\left(\frac{a}{2}, \frac{a}{2}\right)$ (2) $\left(\frac{a}{5}, \frac{b}{5}\right)$ (3) $\left(\frac{a}{3}, \frac{b}{3}\right)$ (4) None of these

Question No.	Questions
6.	The greatest lower bound of a set, if it exists, is : (1) Two (2) Three (3) Four (4) None of these
7.	The interior of a set A is the largest subset of A, which is : (1) Open (2) Closed (3) Both (4) None of these
8.	The sequence $< n^{1/n} >$ converges to the limit : (1) 0 (2) 1 (3) α (4) None of these
9.	The series $\sum_{n=1}^{\alpha} a_n$, where $a_n = \frac{1}{\sqrt{n}} \sin\frac{1}{n}$ is : (1) Oscillating (2) Divergent (3) Convergent (4) None of these
10.	If $\sum_{n=1}^{\alpha} a_n$ is a series of real numbers whose sequence $< S_n >$ of partial sums is bounded and if $< b_n >$ is a non-negative monotonically decreasing sequence tending to zero, then the series $\sum_{n=1}^{\alpha} a_n b_n$ converges. This statement is known as : (1) Abel's test (2) Abel's lemma (3) Dirichlet's test (4) None of these

Question No.	Questions
11.	The differential equation of first order and first degree is homogeneous if : (1) $\frac{dy}{dx} = \phi(y/x)$ (2) $\frac{dy}{dx} =$ constant (3) $\frac{dy}{dx} = \phi(x)$ (4) None of these
12.	The general solution of the differential equation $e^y \frac{dy}{dx} + (e^y + 1)\cot x = 0$ is : (1) $(e^y + 1)\cos x = K$ (2) $(e^y + 1)\operatorname{cosec} x = K$ (3) $(e^y + 1)\sin x = K$ (4) None of these
13.	What is order and degree of the differential equation $\frac{d^2y}{dx^2} + \sqrt{1 + \left(\frac{d^3y}{dx^3}\right)^4} = 0$ (1) First order, second degree (2) Second order, first degree (3) Second order, second degree (4) None of these
14.	Particular integral of the differential equation $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$ is : (1) $2\log x + 4$ (2) $4\log x - 2$ (3) $4\log x - 4$ (4) None of these

Question No.	Questions
15.	For $a, b, c \in R$, if the differential equation $(ax^2 + b\,xy + y^2)dx + (2x^2 + c\,xy + y^2)dy = 0$ is exact, then : (1) $b = a, c = 20$ (2) $b = 4, c = 2$ (3) $b = 2, c = 2$ (4) None of these
16.	The points whose position vectors are $60\hat{i} + 3\hat{j}$; $40\hat{i} - 8\hat{j}$; $a\hat{i} - 52\hat{j}$ are collinear if : (1) $a = 40$ (2) $a = 20$ (3) $a = -40$ (4) None of these
17.	If ϕ is a scalar point function, then curl (grad ϕ) is equal to : (1) 1 (2) 0 (3) -1 (4) None of these
18.	The value of $\oint_c [(\cos x \sin y - xy)dx + \sin x \cos y\, dy]$, where c is circle $x^2 + y^2 = 1$ is : (1) π (2) $\pi/2$ (3) 1 (4) 0
19.	If $\vec{F} = 3xy\,\hat{i} - y^2\,\hat{j}$, then the value of $\int_C \vec{F}.d\vec{r}$, where C is the curve in XY-plane, $y = 2x^2$ from $(0, 0,)$ to $(1, 2)$ is : (1) $\frac{7}{6}$ (2) $\frac{6}{7}$ (3) $\frac{-7}{6}$ (4) None of these

Question No.	Questions
20.	If $\vec{f} = (x+3y)\hat{i} + (y-2z)\hat{j} + (x+az)\hat{k}$ is solenoidal, then a is equal to : (1) 1 (2) 2 (3) 0 (4) -2
21.	If $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$ is equal to : (1) u (2) $2u$ (3) 1 (4) None of these
22.	$\lim_{x \to 0-} \frac{e^{1/x}-1}{e^{1/x}+1}$ is : (1) -1 (2) 0 (3) 1 (4) None of these
23.	Taylor's Theorem is also known as : (1) Ist mean value theorem of differential equation (2) IInd mean value theorem of differential equation (3) Generalised mean value theorem of differential equation (4) None of these
24.	Equation of evolute of parabola $y^2 = 4ax$ is given by : (1) $27ay^2 = 4(x-2a)^3$ (2) $27ay^2 = 4(x-2a)^2$ (3) $27y^2 = 4(x-2a)^3$ (4) None of these
25.	The length of a loop of the curve $r = a(Q^2 - 1)$ is : (1) $\frac{79}{3}$ (2) $\frac{89}{3}$ (3) $\frac{16}{3}$ (4) None of these

Question No.	Questions
26.	The sum of the eigen values of a matrix is equal to : (1) $\|A\|$ (2) The sum of the elements of the principal diagonal (3) The product of the elements on the principal diagonal (4) None of these
27.	If A is a matrix of order n and A^2 is a null matrix, then what is the maximum possible rank of A : (1) n (2) n^2 (3) n^3 (4) None of these
28.	The eigen values of a nilpotent matrix are : (1) 2 (2) 1 (3) 0 (4) None of these
29.	The quadratic form $9x^2 + y^2 + 4z^2 + 6xy - 12xz - 4yz$ is : (1) Positive definite (2) Positive semi-definite (3) Negative definite (4) Negative semi-definite
30.	Let $x^4 - 3x^3 - 5x^2 + 2x - 1 = 0$ (1) All the roots of equation are real. (2) All the roots of equation are purely imaginary. (3) Two real and the two imaginary roots. (4) None of these

Question No.	Questions
31.	A Car weighing 250 kg travelling at 19.6 m/sec. is brought to rest in 4.9 m by application of brakes. Then the force of resistance of brakes is : (1) 7800 Newtons (2) 8800 Newtons (3) 9800 Newtons (4) None of these
32.	The central force is defined as : (1) A force whose line of action always passes through a fixed point (2) A force whose line of action does not pass through a fixed point (3) A force whose line of action always passes through variable point (4) None of these
33.	Polar equation of ellipse referred to focus as pole is : (1) $\frac{l}{r} = 1 + e\cos\theta$ (2) $\frac{l}{r} = 1 - e\cos\theta$ (3) $\frac{l}{r} = e\cos\theta - 1$ (4) None of these
34.	If $r = \sqrt{x^2+y^2}$, $\theta = \tan^{-1}(y/x)$, then $\frac{\partial(r,\theta)}{\partial(x,y)}$ is : (1) $\frac{x}{x^2+y^2}$ (2) $\frac{y}{x^2+y^2}$ (3) $\frac{1}{x^2+y^2}$ (4) $\frac{1}{\sqrt{x^2+y^2}}$
35.	$\int_0^{\alpha} e^{-x^2}dx$ is equal to : (1) $\pi/4$ (2) $\sqrt{\pi}/4$ (3) $\sqrt{\pi}/2$ (4) None of these

Question No.	Questions
36.	The Fourier co-efficient a_n for the function $f(x) = x$ in $[-\pi, \pi]$ is : (1) 1 (2) 0 (3) $-1/2$ (4) None of these
37.	Polar form of C-R equations are : (1) $\frac{\partial u}{\partial \theta} = \frac{1}{r}\frac{\partial v}{\partial r}$, $\frac{\partial v}{\partial r} = r\frac{\partial v}{\partial \theta}$ (2) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$, $\frac{\partial v}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$ (3) $\frac{\partial u}{\partial r} = r\frac{\partial v}{\partial \theta}$, $\frac{\partial u}{\partial \theta} = -r\frac{\partial v}{\partial r}$ (4) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$, $\frac{\partial u}{\partial \theta} = -r\frac{\partial v}{\partial r}$
38.	The function $f(z) = r^2 \cos 2\theta + ir^2 \sin k\theta$ is analytic then the value of k is equal to : (1) 0 (2) 2 (3) 4 (4) None of these
39.	The point on the Complex plane corresponding to the point $\left(\frac{1}{3}, \frac{2}{3}, \frac{2}{3}\right)$ on the Riemann sphere $X^2 + Y^2 + Z^2 = 1$ is : (1) $1 + 2i$ (2) $3 + 2i$ (3) $4 + 3i$ (4) None of these
40.	The angle of rotation at $z = 2 + i$ for the transformation $w = z^2$ is equal to : (1) $\tan^{-1} 1/3$ (2) $\tan^{-1} 1/2$ (3) $\tan^{-1} 2$ (4) None of these

Question No.	Questions
41.	If f is integrable on $[0,1]$, then $\int_0^1 f(x)\,dx$ is equal to : (1) $\lim_{n\to\alpha} \sum_{r=1}^{n} f\left(\frac{r}{n}\right)$ (2) $\lim_{n\to\alpha} \frac{1}{n} \sum_{r=1}^{n} f\left(\frac{r}{n}\right)$ (3) $\lim_{n\to\alpha} \sum_{r=1}^{n} f\left(\frac{n}{r}\right).r$ (4) None of these
42.	The improper integral $\int_0^1 \frac{dx}{x^2-3x+2}$ is : (1) Convergent (2) Oscillating (3) Divergent (4) None of these
43.	Which one is not a complete metric space : (1) The usual metric space (R,d) (2) The space of complex numbers (3) Any discrete metric space (4) None of these
44.	Energy complete metric space is of the second category as a subset of itself is the statement of (1) Banach's fixed point theorem (2) Baire's category theorem (3) Cantor's intersection theorem (4) None of these

Question No.	Questions
45.	If $f(x) = x$, $x \in [0,1]$ and $P = \left\{0, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1\right\}$ be the partition of $[0,1]$, then $L(f, P)$ is equal to : (1) $^{8}/_{26}$ (2) $\frac{7}{16}$ (3) $^{13}/_{36}$ (4) none of these
46.	Which one is not a compact subset? (1) Any finite subset of a metric space (2) A = [–50, 50] of R (3) Set $\left\{\frac{1}{n} : n \in N\right\} \cup \{0\}$ in R (4) Usual metric space (R, d)
47.	Which one is a dense set? (1) Q in R (2) Set of natural numbers in R (3) The subset A = $\left\{\frac{1}{n}, n \in N\right\}$ in R (4) None of these
48.	The number of non-isomorphic abelian groups of order 8 is : (1) 1 (2) 2 (3) 3 (4) none of these

Question No.	Questions
49.	Number of Sylow 2-subgroups of S_3 is : (1) 2 (2) 3 (3) 6 (4) None of these
50.	Energy subgroup of a finite cyclic group is : (1) Characteristic subgroup (2) Normal subgroup (3) Cyclic subgroup (4) None of these
51.	If $\lim_{x\to 0} \frac{x(1+a\cos x)-b\sin x}{x^3} = 1$ then the values of a and b are : (1) 2, 3 (2) $\frac{5}{2}, \frac{3}{2}$ (3) $\frac{-5}{2}, \frac{-3}{2}$ (4) None of these
52.	If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$ is equal to : (1) $3u$ (2) 3 (3) $\frac{3}{x+y+z}$ (4) None of these
53.	The radius of curvature of helix $x = a\cos t, y = a\sin t, z = at\tan\alpha$ is : (1) $a\sec^2\alpha$ (2) $a\,\text{cosec}^2\alpha$ (3) $a\cot\alpha$ (4) None of these
54.	The point $(0, 0)$ for $f(x, y) = x^3 - 3axy + y^3$ is : (1) A maximum point (2) A minimum point (3) A saddle point (4) None of these

Question No.	Questions
55.	The necessary and sufficient condition for the curve to be a plane curve is : (1) $[\vec{r}\ \vec{r}'\ \vec{r}''] = 0$ (2) $[\vec{r}\ \vec{r}''\ \vec{r}'''] = 0$ (3) $[\vec{r}''\ \vec{r}'''\ \vec{r}^{iv}] = 0$ (4) $[\vec{r}'\ \vec{r}''\ \vec{r}'''] = 0$
56.	A partial differential equation by eliminating the arbitrary function from $z = f(x^2 - y^2)$ is given by : (1) $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ (2) $x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y}$ (3) $y\frac{\partial z}{\partial x} - x\frac{\partial z}{\partial y}$ (4) $y\frac{\partial z}{\partial x} + x\frac{\partial z}{\partial y}$
57.	The partial differential equation $\frac{\partial^2 z}{\partial x^2} + 6\frac{\partial^2 z}{\partial x\,\partial y} + 9\frac{\partial^2 z}{\partial y^2} = 0$ is : (1) Hyperbolic (2) Parabolic (3) Elliptic (4) None of these
58.	The particular integral of the equation $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x\,\partial y} = \sin x \cos 2y$ is : (1) $\sin(x + 3y) + \sin(x - 3y)$ (2) $\sin(x + 2y) + \frac{1}{10}\sin(x - 2y)$ (3) $\frac{1}{6}\sin(x + 2y) - \frac{1}{10}\sin(x - 2y)$ (4) None of these

Question No.	Questions
59.	Two dimensional wave equation is given by : (1) $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=\frac{1}{c^2}\frac{\partial u}{\partial t}$ (2) $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=\frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}$ (3) $\frac{\partial^2 u}{\partial x^2}+\frac{\partial u}{\partial y}=\frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}$ (4) None of these
60.	The partial differential equation $x\frac{\partial^2 z}{\partial x^2}+2\frac{\partial^2 z}{\partial y\,\partial x}+y\frac{\partial^2 z}{\partial y^2}+\frac{\partial z}{\partial x}=0$ is hyperbolic in nature if : (1) $xy<1$ (2) $xy=1$ (3) $xy>1$ (4) None of these
61.	If a be any integer and p be any prime number, then $a^p \equiv a \bmod p$ is the statement of : (1) Fermat's theorem (2) Wilson theorem (3) Lagrange's theorem (4) None of these
62.	An ideal of a ring of integers is maximal iff it is generated by some..... (1) Natural number (2) Prime integer (3) Real number (4) None of these
63.	Let f be a ring isomorphism of R onto R′. If R′ is an integral domain, then R is (1) Not an integral domain (2) An integral domain (3) Both (1) and (2) (4) None of these

Question No.	Questions
64.	If 'a' is an irreducible element of a unique factorization domain R, then 'a' must be …… (1) Natural number (2) Real number (3) Prime number (4) None of these
65.	The order of convergence of Regula Falsi Method is : (1) 1 (2) 1.618 (3) 2 (4) none of these
66.	$\Delta f(x)\, g(x)$ is equal to : (1) $f(x)\,\Delta g(x) + g(x)\,\Delta f(x)$ (2) $f(x+h)\,\Delta g(x) + g(x)\,\nabla f(x)$ (3) $f(x+h)\,\Delta g(x) + g(x)\,\Delta f(x)$ (4) None of these
67.	$\mu - \frac{\delta}{2}$ is equal to : (1) $E^{1/2}$ (2) E (3) E^{-1} (4) $E^{-1/2}$
68.	Runge-Kutta method is used for : (1) Interpolation (2) Numerical differentiation (3) Numerical Integration (4) Numerical solution of ordinary differention equation
69.	Milne-Simpron's method is a : (1) Multiple step method (2) Single step method (3) Both (1) and (2) (4) None of these

Question No.	Questions
70.	Which of the following is also known as method of false position? (1) Bisection method (2) Newton Raphson method (3) Regula-falsi method (4) None of these
71.	If T is one–one linear transformation, then dim Ker T is : (1) 0 (2) 1 (3) 2 (4) None of these
72.	The linear transformation $T : R^2 \to R^2$ defined by $T(1, 0) = (2, 3)$, $T(0, 1) = (5, 6)$ is : (1) One-one and onto (2) One-one but not onto (3) Onto but not one-one (4) None of these
73.	Let R be the field of real numbers. Which of the following is not a sub-space of $V_3(R)$: (1) $\{(x, 2y, 3z) : x, y, z \in R\}$ (2) $\{(x, x, x) : x \in R\}$ (3) $\{(x, y, z) : x, y, z$ are rational number$\}$ (4) None of these
74.	If W is a subspace of $V = V_3(R)$ generated by $\{(1,0,0), (1,1,0)\}$. Then basis of V/W is : (1) $\{W + (0,8,8)\}$ (2) $\{W + (0,0,1)\}$ (3) $\{W + (a,0,a) : a \in R\}$ (4) None of these

Question No.	Questions
75.	Let the linear transformation $T_1 : R^2 \to R^2$ such that $T_1(x, y) = (0, 4x)$ and $T_2 : R^2 \to R^2$ such that $T_2(x, y) = (x, 0)$. Then $T_1T_2(x, y)$ is equal to : (1) $(0, 6x)$ (2) $(3x, y)$ (3) $(0, 0)$ (4) $(0, 4x)$
76.	Let $T : U \to V$ be a homomorphism, then Ker T is a subspace of : (1) V (2) U (3) $T(U)$ (4) None of these
77.	Let u, v be normal vectors in an inner product space V s.t. $\|u + v\| = 1$. Then $\|u - v\|$ is : (1) $\sqrt{3}$ (2) 1 (3) $\sqrt{2}$ (4) None of these
78.	The radial and transverse components of velocity of a particle moving along a plane curve $r = f(\theta)$ are : (1) $\frac{d^2y}{dt^2}, r\frac{d^2\theta}{dt^2}$ (2) $\frac{dr}{dt}, \left(\frac{d\theta}{dt}\right)^2$ (3) $\frac{d\theta}{dt}, r^2\frac{d\theta}{dt}$ (4) $\frac{dr}{dt}, r\frac{d\theta}{dt}$
79.	A particle of mass 2 grammes is moving with a S.H.M. If its maximum velocity is 2π cm/sec. and the amplitude of the vibration is 20 cm., then the period of vibration is : (1) 5 seconds (2) 10 seconds (3) 20 seconds (4) None of these

Question No.	Questions
80.	A particle is projected with a velocity of 24.5 m/sec. in a direction making an angle 60° with the horizontal. Then the greatest height attained by the particle is : (1) 22.96 m (2) 11.96 m (3) 36.84 m (4) None of these
81.	The pole of the line $2x + y + 12 = 0$ w.r.t. circle $x^2 + y^2 - 4x + 3y - 1 = 0$ is : (1) $(1, 3)$ (2) $(2, -2)$ (3) $(1, -2)$ (4) None of these
82.	What is the nature of the curve $13x^2 - 18xy + 37y^2 + 2x + 14y - 2 = 0$ (1) Circle (2) Sphere (3) Ellipse (4) None of these
83.	The latus rectum of the conic $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$ is : (1) 2 (2) 4 (3) 6 (4) 8
84.	The length of the major axis of the ellipse $36x^2 + 24xy + 29y^2 - 180 = 0$ is : (1) 2 (2) 4 (3) 6 (4) None of these

Question No.	Questions
85.	The centre of the conicoid $3x^2 + 6yz - y^2 - z^2 - 6x + 6y - 2z - 2 = 0$ (1) $(1, 0, -1)$ (2) $(2, 0, -2)$ (3) $(3, 0, -3)$ (4) None of these
86.	The highest power of 7 contained in 1000! is : (1) 160 (2) 163 (3) 164 (4) None of these
87.	If $(a, b) = 1$, then (ac, b) is equal to : (1) (a, b) (2) (c, b) (3) 1 (4) None of these
88.	The quadratic residue of 17 are : (1) 1, 2, 4, 8, 9, 13, 15, 16 (2) 1, 3, 5, 7, 9, 14, 16 (3) 1, 2, 4, 6, 8, 9, 13, 15 (4) None of these
89.	The real part of $\sin h\ (x + iy)$ is : (1) $\sin h\ x \cos y$ (2) $\sin x \cos h\ y$ (3) $\cos h\ x \sin y$ (4) None of these
90.	If $\tan^{-1} \frac{2x}{1-x^2} + \cot^{-1} \frac{1-x^2}{2x} = \pi/3$, the value of x is equal to : (1) $3 + \sqrt{2}$ (2) $2 - \sqrt{3}$ (3) $3 - \sqrt{2}$ (4) None of these

Question No.	Questions
91.	The radius of convergence of power series $\sum_{m=0}^{\alpha} \frac{(-1)^m}{5^m}(x+1)^{3m}$ is : (1) $5^{1/5}$ (2) $5^{1/3}$ (3) 5 (4) None of these
92.	The value of $H_{2n}(0)$ is : (1) $(-1)^n \frac{(2n)!}{n!}$ (2) $(-1)^n \frac{(2n-1)!}{(n-1)!}$ (3) $\frac{(2n)!}{n!}$ (4) None of these
93.	The value of $L^{-1}\left(\frac{s}{4s^2+15}\right)$ is : (1) $\frac{1}{2}\sin\frac{\sqrt{15}}{2}t$ (2) $\frac{1}{4}\cos\frac{\sqrt{15}}{2}t$ (3) $\frac{1}{4}\tan\frac{\sqrt{15}}{2}t$ (4) None of these
94.	The finite sine transform of $f(x) = 2x$, where $0 < x < 4$, is equal to (1) $\frac{16}{n\pi}$ (2) $\frac{32}{n\pi}$ (3) $\frac{-32}{n\pi}(-1)^n$ (4) None of these
95.	The Fourier cosine transform of $f(x) = \begin{cases} 1, & 0 \le x < 1 \\ 0, & x > 1 \end{cases}$ is equal to : (1) $\frac{\sin s}{s}$ (2) $\frac{\cos s}{s}$ (3) $\frac{\sec s}{s}$ (4) None of these

Question No.	Questions
96.	C programming language was developed by : (1) Bill Gates (2) Ken Thompson (3) Dennis Ritchie (4) None of these
97.	Which of the following key word is used for the storage class? (1) print f (2) external (3) auto (4) scan f
98.	The bitwise AND operator is used for : (1) Masking (2) Comparison (3) Division (4) Shifting bits
99.	Which of the following statements is true? (1) C library functions provide I/O facilities (2) C inherent I/O facilities (3) C does not have I/O facilities (4) Both (1) and (3)
100.	Which of the following variable names is NOT valid? (1) go-cart (2) go 4 it (3) 4 reason (4) run 4

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PG-EE-July, 2025 (Mathematics)

10080

Sr. No._____

Code D

Time : 1¼ Hours **Total Questions : 100** **Max. Marks : 100**

Roll No. _____ (in figure)_____ (in words)

Name : _____ Date of Birth : _____

Father's Name : _____ Mother's Name : _____

Date of Examination : _____

(Signature of the candidate) (Signature of the Invigilator)

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

1. **All questions are compulsory.**
2. The candidates must return the Question 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 shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.
5. The candidate MUST NOT do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question book-let itself. Answers 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.**
7. Use only Black or Blue **BALL POINT PEN** of good quality in the OMR Answer-Sheet.
8. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

Question No.	Questions
1.	If a be any integer and p be any prime number, then $a^p \equiv a \bmod p$ is the statement of : (1) Fermat's theorem (2) Wilson theorem (3) Lagrange's theorem (4) None of these
2.	An ideal of a ring of integers is maximal iff it is generated by some..... (1) Natural number (2) Prime integer (3) Real number (4) None of these
3.	Let f be a ring isomorphism of R onto R′. If R′ is an integral domain, then R is (1) Not an integral domain (2) An integral domain (3) Both (1) and (2) (4) None of these
4.	If 'a' is an irreducible element of a unique factorization domain R, then 'a' must be ..... (1) Natural number (2) Real number (3) Prime number (4) None of these
5.	The order of convergence of Regula Falsi Method is : (1) 1 (2) 1.618 (3) 2 (4) none of these
6.	$\Delta f(x)\, g(x)$ is equal to : (1) $f(x)\,\Delta g(x) + g(x)\,\Delta f(x)$ (2) $f(x+h)\,\Delta g(x) + g(x)\,\nabla f(x)$ (3) $f(x+h)\,\Delta g(x) + g(x)\,\Delta f(x)$ (4) None of these

Question No.	Questions
7.	$\mu - \frac{\delta}{2}$ is equal to : (1) $E^{1/2}$ (2) E (3) E^{-1} (4) $E^{-1/2}$
8.	Runge-Kutta method is used for : (1) Interpolation (2) Numerical differentiation (3) Numerical Integration (4) Numerical solution of ordinary differention equation
9.	Milne-Simpron's method is a : (1) Multiple step method (2) Single step method (3) Both (1) and (2) (4) None of these
10.	Which of the following is also known as method of false position? (1) Bisection method (2) Newton Raphson method (3) Regula-falsi method (4) None of these
11.	The radius of convergence of power series $\sum_{m=0}^{\alpha} \frac{(-1)^m}{5^m}(x+1)^{3m}$ is : (1) $5^{1/5}$ (2) $5^{1/3}$ (3) 5 (4) None of these

Question No.	Questions
12.	The value of $H_{2n}(0)$ is : (1) $(-1)^n \frac{(2n)!}{n!}$ (2) $(-1)^n \frac{(2n-1)!}{(n-1)!}$ (3) $\frac{(2n)!}{n!}$ (4) None of these
13.	The value of $L^{-1}\left(\frac{s}{4s^2+15}\right)$ is : (1) $\frac{1}{2}\sin\frac{\sqrt{15}}{2}t$ (2) $\frac{1}{4}\cos\frac{\sqrt{15}}{2}t$ (3) $\frac{1}{4}\tan\frac{\sqrt{15}}{2}t$ (4) None of these
14.	The finite sine transform of $f(x) = 2x$, where $0 < x < 4$, is equal to (1) $\frac{16}{n\pi}$ (2) $\frac{32}{n\pi}$ (3) $\frac{-32}{n\pi}(-1)^n$ (4) None of these
15.	The Fourier cosine transform of $f(x) = \begin{cases} 1, & 0 \le x < 1 \\ 0, & x > 1 \end{cases}$ is equal to : (1) $\frac{\sin s}{s}$ (2) $\frac{\cos s}{s}$ (3) $\frac{\sec s}{s}$ (4) None of these
16.	C programming language was developed by : (1) Bill Gates (2) Ken Thompson (3) Dennis Ritchie (4) None of these

Question No.	Questions
17.	Which of the following key word is used for the storage class? (1) print f (2) external (3) auto (4) scan f
18.	The bitwise AND operator is used for : (1) Masking (2) Comparison (3) Division (4) Shifting bits
19.	Which of the following statements is true? (1) C library functions provide I/O facilities (2) C inherent I/O facilities (3) C does not have I/O facilities (4) Both (1) and (3)
20.	Which of the following variable names is NOT valid? (1) go-cart (2) go 4 it (3) 4 reason (4) run 4
21.	If $\lim_{x\to 0} \frac{x(1+a\cos x)-b\sin x}{x^3} = 1$ then the values of a and b are : (1) 2, 3 (2) $\frac{5}{2}, \frac{3}{2}$ (3) $\frac{-5}{2}, \frac{-3}{2}$ (4) None of these

Question No.	Questions
22.	If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$ is equal to : (1) $3u$ (2) 3 (3) $\frac{3}{x+y+z}$ (4) None of these
23.	The radius of curvature of helix $x = a\cos t, y = a\sin t, z = at\tan\alpha$ is : (1) $a\sec^2\alpha$ (2) $a\,\text{cosec}^2\alpha$ (3) $a\cot\alpha$ (4) None of these
24.	The point $(0,0)$ for $f(x,y) = x^3 - 3axy + y^3$ is : (1) A maximum point (2) A minimum point (3) A saddle point (4) None of these
25.	The necessary and sufficient condition for the curve to be a plane curve is : (1) $\left[\vec{r}\ \vec{r}'\ \vec{r}''\right] = 0$. (2) $\left[\vec{r}\ \vec{r}''\ \vec{r}'''\right] = 0$ (3) $\left[\vec{r}''\ \vec{r}'''\ \vec{r}^{iv}\right] = 0$ (4) $\left[\vec{r}'\ \vec{r}''\ \vec{r}'''\right] = 0$
26.	A partial differential equation by eliminating the arbitrary function from $z = f(x^2 - y^2)$ is given by : (1) $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ (2) $x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y}$ (3) $y\frac{\partial z}{\partial x} - x\frac{\partial z}{\partial y}$ (4) $y\frac{\partial z}{\partial x} + x\frac{\partial z}{\partial y}$

Question No.	Questions
27.	The partial differential equation $\frac{\partial^2 z}{\partial x^2} + 6\frac{\partial^2 z}{\partial x\,\partial y} + 9\frac{\partial^2 z}{\partial y^2} = 0$ is : (1) Hyperbolic (2) Parabolic (3) Elliptic (4) None of these
28.	The particular integral of the equation $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x\,\partial y} = \sin x \cos 2y$ is : (1) $\sin(x+3y) + \sin(x-3y)$ (2) $\sin(x+2y) + \frac{1}{10}\sin(x-2y)$ (3) $\frac{1}{6}\sin(x+2y) - \frac{1}{10}\sin(x-2y)$ (4) None of these
29.	Two dimensional wave equation is given by : (1) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2}\frac{\partial u}{\partial t}$ (2) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}$ (3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial y} = \frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}$ (4) None of these
30.	The partial differential equation $x\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial y\,\partial x} + y\frac{\partial^2 z}{\partial y^2} + \frac{\partial z}{\partial x} = 0$ is hyperbolic in nature if : (1) $xy < 1$ (2) $xy = 1$ (3) $xy > 1$ (4) None of these
31.	The pole of the line $2x + y + 12 = 0$ w.r.t. circle $x^2 + y^2 - 4x + 3y - 1 = 0$ is : (1) $(1, 3)$ (2) $(2, -2)$ (3) $(1, -2)$ (4) None of these

Question No.	Questions
32.	What is the nature of the curve $13x^2 - 18xy + 37y^2 + 2x + 14y - 2 = 0$ (1) Circle (2) Sphere (3) Ellipse (4) None of these
33.	The latus rectum of the conic $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$ is : (1) 2 (2) 4 (3) 6 (4) 8
34.	The length of the major axis of the ellipse $36x^2 + 24xy + 29y^2 - 180 = 0$ is : (1) 2 (2) 4 (3) 6 (4) None of these
35.	The centre of the conicoid $3x^2 + 6yz - y^2 - z^2 - 6x + 6y - 2z - 2 = 0$ (1) $(1, 0, -1)$ (2) $(2, 0, -2)$ (3) $(3, 0, -3)$ (4) None of these
36.	The highest power of 7 contained in 1000! is : (1) 160 (2) 163 (3) 164 (4) None of these
37.	If $(a, b) = 1$, then (ac, b) is equal to : (1) (a, b) (2) (c, b) (3) 1 (4) None of these
38.	The quadratic residue of 17 are : (1) 1, 2, 4, 8, 9, 13, 15, 16 (2) 1, 3, 5, 7, 9, 14, 16 (3) 1, 2, 4, 6, 8, 9, 13, 15 (4) None of these

Question No.	Questions
39.	The real part of $\sin h\ (x + iy)$ is : (1) $\sin h\ x \cos y$ (2) $\sin x \cos h\ y$ (3) $\cos h\ x \sin y$ (4) None of these
40.	If $\tan^{-1} \frac{2x}{1-x^2} + \cot^{-1} \frac{1-x^2}{2x} = \pi/3$, the value of x is equal to : (1) $3 + \sqrt{2}$ (2) $2 - \sqrt{3}$ (3) $3 - \sqrt{2}$ (4) None of these
41.	A Car weighing 250 kg travelling at 19.6 m/sec. is brought to rest in 4.9 m by application of brakes. Then the force of resistance of brakes is : (1) 7800 Newtons (2) 8800 Newtons (3) 9800 Newtons (4) None of these
42.	The central force is defined as : (1) A force whose line of action always passes through a fixed point (2) A force whose line of action does not pass through a fixed point (3) A force whose line of action always passes through variable point (4) None of these
43.	Polar equation of ellipse referred to focus as pole is : (1) $\frac{l}{r} = 1 + e \cos\theta$ (2) $\frac{l}{r} = 1 - e \cos\theta$ (3) $\frac{l}{r} = e \cos\theta - 1$ (4) None of these

Question No.	Questions
44.	If $r = \sqrt{x^2+y^2}$, $\theta = \tan^{-1}(y/x)$, then $\frac{\partial(r,\theta)}{\partial(x,y)}$ is : (1) $\frac{x}{x^2+y^2}$ (2) $\frac{y}{x^2+y^2}$ (3) $\frac{1}{x^2+y^2}$ (4) $\frac{1}{\sqrt{x^2+y^2}}$
45.	$\int_0^{\alpha} e^{-x^2} dx$ is equal to : (1) $\pi/4$ (2) $\sqrt{\pi}/4$ (3) $\sqrt{\pi}/2$ (4) None of these
46.	The Fourier co-efficient a_n for the function $f(x) = x$ in $[-\pi, \pi]$ is : (1) 1 (2) 0 (3) $-1/2$ (4) None of these
47.	Polar form of C-R equations are : (1) $\frac{\partial u}{\partial \theta} = \frac{1}{r}\frac{\partial v}{\partial r}$, $\frac{\partial v}{\partial r} = r\frac{\partial v}{\partial \theta}$ (2) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$, $\frac{\partial v}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$ (3) $\frac{\partial u}{\partial r} = r\frac{\partial v}{\partial \theta}$, $\frac{\partial u}{\partial \theta} = -r\frac{\partial v}{\partial r}$ (4) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$, $\frac{\partial u}{\partial \theta} = -r\frac{\partial v}{\partial r}$
48.	The function $f(z) = r^2 \cos 2\theta + ir^2 \sin k\theta$ is analytic then the value of k is equal to : (1) 0 (2) 2 (3) 4 (4) None of these

Question No.	Questions
49.	The point on the Complex plane corresponding to the point $\left(\frac{1}{3}, \frac{2}{3}, \frac{2}{3}\right)$ on the Riemann sphere $X^2 + Y^2 + Z^2 = 1$ is : (1) $1 + 2i$ (2) $3 + 2i$ (3) $4 + 3i$ (4) None of these
50.	The angle of rotation at $z = 2 + i$ for the transformation $w = z^2$ is equal to : (1) $\tan^{-1} 1/3$ (2) $\tan^{-1} 1/2$ (3) $\tan^{-1} 2$ (4) None of these
51.	If f is integrable on $[0,1]$, then $\int_0^1 f(x)\,dx$ is equal to : (1) $\lim_{n\to\alpha} \sum_{r=1}^{n} f\left(\frac{r}{n}\right)$ (2) $\lim_{n\to\alpha} \frac{1}{n} \sum_{r=1}^{n} f\left(\frac{r}{n}\right)$ (3) $\lim_{n\to\alpha} \sum_{r=1}^{n} f\left(\frac{n}{r}\right).r$ (4) None of these
52.	The improper integral $\int_0^1 \frac{dx}{x^2-3x+2}$ is : (1) Convergent (2) Oscillating (3) Divergent (4) None of these
53.	Which one is not a complete metric space : (1) The usual metric space (R,d) (2) The space of complex numbers (3) Any discrete metric space (4) None of these

Question No.	Questions
54.	Energy complete metric space is of the second category as a subset of itself is the statement of (1) Banach's fixed point theorem (2) Baire's category theorem (3) Cantor's intersection theorem (4) None of these
55.	If $f(x) = x$, $x \in [0,1]$ and $P = \left\{0, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1\right\}$ be the partition of [0,1], then $L(f, P)$ is equal to : (1) $^{8}/_{26}$ (2) $\frac{7}{16}$ (3) $^{13}/_{36}$ (4) none of these
56.	Which one is not a compact subset? (1) Any finite subset of a metric space (2) A = [–50, 50] of R (3) Set $\left\{\frac{1}{n} : n \in N\right\} \cup \{0\}$ in R (4) Usual metric space (R, d)
57.	Which one is a dense set? (1) Q in R (2) Set of natural numbers in R (3) The subset A = $\left\{\frac{1}{n}, n \in N\right\}$ in R (4) None of these

Question No.	Questions
58.	The number of non-isomorphic abelian groups of order 8 is : (1) 1 (2) 2 (3) 3 (4) none of these
59.	Number of Sylow 2-subgroups of S_3 is : (1) 2 (2) 3 (3) 6 (4) None of these
60.	Energy subgroup of a finite cyclic group is : (1) Characteristic subgroup (2) Normal subgroup (3) Cyclic subgroup (4) None of these
61.	If T is one–one linear transformation, then dim Ker T is : (1) 0 (2) 1 (3) 2 (4) None of these
62.	The linear transformation $T : R^2 \to R^2$ defined by $T(1, 0) = (2, 3)$, $T(0, 1) = (5, 6)$ is : (1) One-one and onto (2) One-one but not onto (3) Onto but not one-one (4) None of these
63.	Let R be the field of real numbers. Which of the following is not a sub-space of $V_3(R)$: (1) $\{(x, 2y, 3z) : x, y, z \in R\}$ (2) $\{(x, x, x) : x \in R\}$ (3) $\{(x, y, z) : x, y, z$ are rational number$\}$ (4) None of these

Question No.	Questions
64.	If W is a subspace of $V = V_3(R)$ generated by $\{(1,0,0),(1,1,0)\}$. Then basis of V/W is : (1) $\{W + (0,8,8)\}$ (2) $\{W + (0,0,1)\}$ (3) $\{W + (a,0,a) : a \in R\}$ (4) None of these
65.	Let the linear transformation $T_1 : R^2 \to R^2$ such that $T_1(x,y) = (0,4x)$ and $T_2 : R^2 \to R^2$ such that $T_2(x,y) = (x,0)$. Then $T_1T_2(x,y)$ is equal to : (1) $(0,6x)$ (2) $(3x,y)$ (3) $(0,0)$ (4) $(0,4x)$
66.	Let $T : U \to V$ be a homomorphism, then Ker T is a subspace of : (1) V (2) U (3) $T(U)$ (4) None of these
67.	Let u, v be normal vectors in an inner product space V s.t. $\|u+v\| = 1$. Then $\|u-v\|$ is : (1) $\sqrt{3}$ (2) 1 (3) $\sqrt{2}$ (4) None of these
68.	The radial and transverse components of velocity of a particle moving along a plane curve $r = f(\theta)$ are : (1) $\frac{d^2y}{dt^2}, r\frac{d^2\theta}{dt^2}$ (2) $\frac{dr}{dt}, \left(\frac{d\theta}{dt}\right)^2$ (3) $\frac{d\theta}{dt}, r^2\frac{d\theta}{dt}$ (4) $\frac{dr}{dt}, r\frac{d\theta}{dt}$

Question No.	Questions
69.	A particle of mass 2 grammes is moving with a S.H.M. If its maximum velocity is 2π cm/sec. and the amplitude of the vibration is 20 cm., then the period of vibration is : (1) 5 seconds (2) 10 seconds (3) 20 seconds (4) None of these
70.	A particle is projected with a velocity of 24.5 m/sec. in a direction making an angle 60° with the horizontal. Then the greatest height attained by the particle is : (1) 22.96 m (2) 11.96 m (3) 36.84 m (4) None of these
71.	One Joule is equal to : (1) 10^3 ergs (2) 10^5 ergs (3) 10^8 ergs (4) None of these
72.	The magnitude and direction of the resultant of two forces of magnitudes 12 N and 14 N, acting at a point and inclined to each other at an angle of 45° is : (1) $R = 42.3$ N, $\theta = 45°$ (2) $R = 4.2$ N, $\theta = 90°$ (3) $R = 0.45$ N, $\theta = \tan^{-1}(24.03)$ (4) $R = 24.03$ N, $\theta = \tan^{-1}(0.45)$

Question No.	Questions
73.	If ABCD is a square of side 2m. Forces of magnitude 5, 3, 4 and 6 Newtons act along CB, BA, DA and DB respectively. Then the algebraic sum of moments of the forces about vertex C is : (1) $3(1+2\sqrt{2})$ Nm (2) $[3(1-2\sqrt{2})]$ Nm (3) $2(4-3\sqrt{2})$ Nm (4) $2(1+3\sqrt{2})$ Nm
74.	The constant ratio which the limiting friction bears to the normal reaction is called : (1) Limiting friction (2) Angle of friction (3) Cone of friction (4) Co-efficient of friction
75.	The centre of gravity of the area of the position of the parabola $\sqrt{\frac{x}{a}}+\sqrt{\frac{y}{b}}=1$ between the curve and the axes is : (1) $\left(\frac{a}{2},\frac{a}{2}\right)$ (2) $\left(\frac{a}{5},\frac{b}{5}\right)$ (3) $\left(\frac{a}{3},\frac{b}{3}\right)$ (4) None of these
76.	The greatest lower bound of a set, if it exists, is : (1) Two (2) Three (3) Four (4) None of these
77.	The interior of a set A is the largest subset of A, which is : (1) Open (2) Closed (3) Both (4) None of these

Question No.	Questions
78.	The sequence $< n^{1/n} >$ converges to the limit : (1) 0 (2) 1 (3) α (4) None of these
79.	The series $\sum_{n=1}^{\alpha} a_n$, where $a_n = \frac{1}{\sqrt{n}} \sin\frac{1}{n}$ is : (1) Oscillating (2) Divergent (3) Convergent (4) None of these
80.	If $\sum_{n=1}^{\alpha} a_n$ is a series of real numbers whose sequence $< S_n >$ of partial sums is bounded and if $< b_n >$ is a non-negative monotonically decreasing sequence tending to zero, then the series $\sum_{n=1}^{\alpha} a_n b_n$ converges. This statement is known as : (1) Abel's test (2) Abel's lemma (3) Dirichlet's test (4) None of these
81.	The differential equation of first order and first degree is homogeneous if : (1) $\frac{dy}{dx} = \phi(y/x)$ (2) $\frac{dy}{dx} =$ constant (3) $\frac{dy}{dx} = \phi(x)$ (4) None of these
82.	The general solution of the differential equation $e^y \frac{dy}{dx} + (e^y + 1)\cot x = 0$ is : (1) $(e^y + 1)\cos x = K$ (2) $(e^y + 1)\operatorname{cosec} x = K$ (3) $(e^y + 1)\sin x = K$ (4) None of these

Question No.	Questions
83.	What is order and degree of the differential equation $\frac{d^2y}{dx^2} + \sqrt{1 + \left(\frac{d^3y}{dx^3}\right)^4} = 0$ (1) First order, second degree (2) Second order, first degree (3) Second order, second degree (4) None of these
84.	Particular integral of the differential equation $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$ is : (1) $2\log x + 4$ (2) $4\log x - 2$ (3) $4\log x - 4$ (4) None of these
85.	For $a, b, c \in R$, if the differential equation $(ax^2 + b\,xy + y^2)dx + (2x^2 + c\,xy + y^2)dy = 0$ is exact, then : (1) $b = a, c = 20$ (2) $b = 4, c = 2$ (3) $b = 2, c = 2$ (4) None of these
86.	The points whose position vectors are $60\hat{i} + 3\hat{j}$; $40\hat{i} - 8\hat{j}$; $a\hat{i} - 52\hat{j}$ are collinear if : (1) $a = 40$ (2) $a = 20$ (3) $a = -40$ (4) None of these
87.	If ϕ is a scalar point function, then curl (grad ϕ) is equal to : (1) 1 (2) 0 (3) -1 (4) None of these

Question No.	Questions
88.	The value of $\oint_c [(\cos x \sin y - xy)dx + \sin x \cos y \, dy]$, where c is circle $x^2 + y^2 = 1$ is : (1) π (2) $\pi/2$ (3) 1 (4) 0
89.	If $\vec{F} = 3xy\,\hat{i} - y^2\,\hat{j}$, then the value of $\int_C \vec{F}.d\vec{r}$, where C is the curve in XY-plane, $y = 2x^2$ from $(0,0,)$ to $(1,2)$ is : (1) $\frac{7}{6}$ (2) $\frac{6}{7}$ (3) $\frac{-7}{6}$ (4) None of these
90.	If $\vec{f} = (x + 3y)\,\hat{i} + (y - 2z)\,\hat{j} + (x + az)\,\hat{k}$ is solenoidal, then a is equal to (1) 1 (2) 2 (3) 0 (4) -2
91.	If $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$ is equal to : (1) u (2) $2u$ (3) 1 (4) None of these
92.	$\lim_{x \to 0-} \frac{e^{1/x}-1}{e^{1/x}+1}$ is : (1) -1 (2) 0 (3) 1 (4) None of these

Question No.	Questions
93.	Taylor's Theorem is also known as : (1) Ist mean value theorem of differential equation (2) IInd mean value theorem of differential equation (3) Generalised mean value theorem of differential equation (4) None of these
94.	Equation of evolute of parabola $y^2 = 4ax$ is given by : (1) $27ay^2 = 4(x - 2a)^3$ (2) $27ay^2 = 4(x - 2a)^2$ (3) $27y^2 = 4(x - 2a)^3$ (4) None of these
95.	The length of a loop of the curve $r = a(Q^2 - 1)$ is : (1) $\frac{79}{3}$ (2) $\frac{89}{3}$ (3) $\frac{16}{3}$ (4) None of these
96.	The sum of the eigen values of a matrix is equal to : (1) $\|A\|$ (2) The sum of the elements of the principal diagonal (3) The product of the elements on the principal diagonal (4) None of these
97.	If A is a matrix of order n and A^2 is a null matrix, then what is the maximum possible rank of A : (1) n (2) n^2 (3) n^3 (4) None of these

Question No.	Questions
98.	The eigen values of a nilpotent matrix are : (1) 2 (2) 1 (3) 0 (4) None of these
99.	The quadratic form $9x^2 + y^2 + 4z^2 + 6xy - 12xz - 4yz$ is : (1) Positive definite (2) Positive semi-definite (3) Negative definite (4) Negative semi-definite
100.	Let $x^4 - 3x^3 - 5x^2 + 2x - 1 = 0$ (1) All the roots of equation are real. (2) All the roots of equation are purely imaginary. (3) Two real and the two imaginary roots. (4) None of these

Answer keys of M.Sc.(Mathematics)/M.Sc.(Mathematics) under SFS entrance exam dated 16.07.2025				
Q. NO.	A	B	C	D
1	4	3	4	1
2	1	3	4	2
3	3	4	4	2
4	1	2	4	3
5	2	1	2	2
6	2	3	4	3
7	4	2	1	4
8	3	1	2	4
9	2	1	3	1
10	1	2	3	3
11	3	3	1	2
12	3	1	3	1
13	4	1	4	2
14	2	4	1	3
15	1	3	2	1
16	3	2	3	1
17	2	4	2	3
18	1	2	4	1
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23	4	2	3	1
24	1	3	1	3
25	2	2	2	4
26	3	3	2	4
27	2	4	4	2
28	4	4	3	3
29	3	1	2	2
30	4	3	1	1
31	3	2	3	3
32	2	1	1	3
33	1	2	1	4
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36	4	1	2	3
37	2	3	4	2
38	3	1	2	1
39	2	4	1	1
40	1	3	2	2
41	4	3	2	3
42	4	2	3	1
43	4	1	4	1
44	4	3	2	4
45	2	4	3	3
46	4	4	4	2
47	1	2	1	4
48	2	3	3	2
49	3	2	2	1
50	3	1	1	2

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Answer keys of M.Sc.(Mathematics)/M.Sc.(Mathematics) under SFS entrance exam dated 16.07.2025				
Q. NO.	A	B	C	D
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91	3	1	2	4
92	1	1	1	1
93	1	3	2	3
94	4	2	3	1
95	3	4	1	2
96	2	2	1	2
97	4	2	3	4
98	2	4	1	3
99	1	3	4	2
100	2	1	3	1

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