

Instructions for Test – (Mathematics)

1. There are 100 questions and you have 90 minutes to attempt them.
2. Write your name and roll number on the answer sheet and on the specified space given in question paper only.
3. There are two tests in total. Out of these, first test is for Mathematics and second one for your competency in English language.
4. Every question is followed by four/five alternative answers lettered as A, B, C, D and E.
5. Use of calculator is not allowed.
6. You should use a block marker to fill the correct box on the answer sheet against the question number.
7. Squares not completely filled will be considered as incorrect answers.
8. If you fill more than one alternative for one question, neither will be valid.
9. All questions carry equal marks.
10. After completion of the test, you must hand over the answer sheet and question paper both to the examiner. Papers of candidates failing to do so will be cancelled.
11. The result declared will be final, i.e., no objection will be accepted nor any answer sheet will be shown.
12. Do not write anything on the question paper. Rough work may be done on sheets provided separately for this purpose.
13. Start the test only when you are instructed to do so.
14. Stop immediately when announced.
15. Do not go to the next test until announced.
16. Violation of instruction may lead to expulsion from the test.

Example:

If the dispersion is small, the standard deviation is:

- | | |
|----------|-------------|
| A) large | B) zero |
| C) small | D) negative |

The correct answer for the above question is small; therefore fill the square under C in your answer sheet as shown below.

A	B	C	D	E
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

DO NOT TURN THE PAGE

Total marks 100

Time duration 90 mints

Section I: Mathematics

- Q:-1 Limit of the sequence $\left\{ \frac{6}{12n+1} \right\}$ is
 A) 0 B) 1 C) 2
 D) 3 E) None of these
- Q:-2 When the general second order equation represents a pair of lines then these are right angles if
 A) $a+b=0$ B) $a-b=0$ C) $h-ab=0$
 D) $a=b$ E) None of these
- Q:-3 If $a * b = 2^{a^2+b^2}$ then $*$ is a binary operation on -----.
 A) \mathbf{Z} B) \mathbf{Q} C) \mathbf{C}
 D) \mathbf{R} E) All of these
- Q:-4 The centre of mass of a solid hemisphere with radius a from the centre O is
 A) $\frac{3}{8}a$ B) $\frac{1}{4}a$ C) $\frac{5}{8}a$
 D) $\frac{1}{3}a$ E) None of these
- Q:-5 The asymptotes of the curve $y = x + \ln x$ is
 A) $x = a$ B) $x = b$ C) $x = 0$
 D) $x = -a$ E) None of these
- Q:-6 The absolute value of the rate change of the angle of tangent is called -----.
 A) Radius of curvature B) Curvature C) Arc length
 D) None of these
- Q:-7 If the $(3\sqrt{2}, -3\sqrt{2})$ then in polar coordinates $\theta =$
 A) 100π B) 50π C) $\frac{50}{\pi}$
 D) $\frac{\pi}{10}$ E) $\frac{3\pi}{4}$
- Q:-8 The range of a projectile is maximum when it is projected through an angle of measure
 A) $\frac{\pi}{6}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{2}$
 D) $\frac{\pi}{4}$ E) None of these
- Q:-9 The rank of $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 1 & 0 \\ -2 & -1 & 3 \\ -1 & 4 & -2 \end{bmatrix}$ is ----.
 A) $\mathbf{3}$ B) $\mathbf{0}$ C) $\mathbf{1}$
 D) $\mathbf{2}$ E) None of these

Q:-10 $\frac{ydx - xdy}{x^2 + y^2} =$

- A) $d\left(\frac{\ln x}{y}\right)$ B) $d\left(\frac{\arctan x}{y}\right)$ C) $d\left(\frac{x}{y}\right)$
 D) $d(y/x)$ E) $d\left(\frac{\ln y}{x}\right)$

Q:-11 A car is moving with constant acceleration and applied brake to make it stop, it stops 10 seconds after the brake and travels 300m the distance covered in this time is

- A) **600m** B) **300m** C) **200m**
 D) **100m** E) 500m

Q:-12 The critical point at which f does not have a relative extrema is called a -----point.

- A) Inflection B) Saddle C) Minima
 D) Maxima E) None of these

Q:-13 If a particle be in limiting equilibrium on an inclined plane under its own weight, the inclination of the plane the magnitude or the angle of friction.

- A) $>$ B) $<$ C) \neq
 D) \neq E) $=$

Q:-14 The pedal equation of $x = a(\cos[\theta])^2$, $y = a(\sin[\theta])^2$ is

- A) $r^2 = a^2 - 3p^2$ B) $r^2 = a^2 - 3p^2$ C) $r^2 = a^4 - 3p^2$
 D) $r^2 = a^2 - 3p^2$ E) None of these

Q:-15 _____ is an eigen vector of $A = \begin{bmatrix} 1 & 1 \\ -2 & 4 \end{bmatrix}$.

- A) $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$ B) $\begin{bmatrix} -1 \\ 1 \end{bmatrix}$ C) $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$
 D) $\begin{bmatrix} -1 \\ 2 \end{bmatrix}$ E) None of these

Q:-16 Radius of the convergence of the series $\sum x^n n! / n^n$

- A) $\frac{1}{e}$ B) **1** C) **e**
 D) $\frac{e}{2}$ E) None of these

Q:-17 If s is the arc length of a curve and α is angle of tangent line then a relation between s and α is called----- equation.

- A) intrinsic B) pedal C) simple
 D) None of these

Q:-18 Kepler's laws are about

- A) rectilinear motion B) orbital motion C) projectile motion
 D) constrained motion E) resisted motion

- Q:-19 Find y' where $y = \frac{\ln x}{9}$
- A) $\frac{2}{x}$ B) $\frac{1}{x}$ C) $\frac{4}{x}$
 D) $\frac{-1}{x}$ E) None of these
- Q:-20 If (1, -1, 1, -1) and (-1, 2, 2, c) are orthogonal then c = ----.
- A) 2 B) -1 C) -2
 D) 1 E) 0
- Q:-21 Limit of the sequence $5^n / (n+1)^2$ is
- A) 0 B) -1 C) 5
 D) Not exist E) 1/5
- Q:-22 For symmetry about y-axis we replace (r, θ) by
- A) (r, θ) B) (-r, θ) C) (-r, $-\theta$)
 D) (r, $-\theta$) E) None of these
- Q:-23 The two planes are parallel if their normals are -----.
- A) Parallel B) Perpendicular C) Intersect
 D) None of these
- Q:-24 If a rigid body is in equilibrium under the action of three coplanar forces, the lines of action of the forces must be
- A) Either concurrent or parallel B) Concurrent
 C) Parallel D) Both E) None of these
- Q:-25 The area bounded by the curve $9x^2 + x = 2$ and the y-axis is
- A) $\frac{6\sqrt{2}}{9}$ B) $\frac{0\sqrt{2}}{9}$ C) $\frac{10\sqrt{2}}{9}$
 D) $\frac{8\sqrt{2}}{9}$ E) None of these
- Q:-26 Find the value of the convergent integral $\int \frac{dx}{1+x^2}$
- A) $\frac{\pi}{4}$ B) $\frac{\pi}{2}$ C) $\frac{\pi}{6}$
 D) $\frac{\pi}{8}$ E) None of these
- Q:-27 The linear system $\begin{matrix} 2x_1 + x_2 + 5x_3 = 4 \\ 3x_1 - 2x_2 + 2x_3 = 2 \\ 5x_1 - 8x_2 - 4x_3 = 1 \end{matrix}$ has ----- .
- A) No solution B) Two solutions C) Unique solution
 D) Infinitely many solutions E) None of these
- Q:-28 Let $A = \begin{bmatrix} 7 & 0 & 1 & 4 \\ 0 & 3 & 3 & 5 \\ 0 & 0 & 2 & 1 \\ 0 & 0 & 0 & -6 \end{bmatrix}$ then eigen values of A are ---
- A) 7, 3, 2, -6 B) 7, 0, 1, 4 C) -7, 3, -2, 6
 D) 4, 5, 1, -6 E) None of these

Q:-29 If $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ s.t. $T(1, -1) = 3$ and $T(0, 1) = -2$ then $T(2, 3) =$ _____
 A) 5 B) -4 C) 2 (D) -5 E) 6

Q:-30 The series $1 - 1/2 + 1/3 - 1/4 + \dots$ is _____
 A) Diverges B) Conditionally converges C) Converges
 D) Absolutely converges E) None of these

Q:-31 $\lim_{x \rightarrow 0} \sin x \cos x =$ _____
 A) One B) 0 C) No
 D) Infinite E) None of these

Q:-32 If the series $\sum a_n$ converges and diverges absolutely then it is _____
 A) Conditionally convergent B) Conditionally divergent
 C) Convergent D) Absolutely convergent E) Divergent

Q:-33 $\frac{dy}{dx} + xy = xy^2$ is the _____ differential equation.
 A) Bernoulli B) Riccati C) Clairauts
 D) linear E) Non linear

Q:-34 Orthogonal trajectory of the family of circles is the family of _____
 A) Straight line B) Parabola C) Hyperbola
 D) Ellipse E) Plane

Q:-35 The singular solution of $y = xp + \frac{1}{4}p^4$ is _____
 A) $y = -p^2$ B) $x = p^2$ C) $x = -p^2$
 D) $y = p^2$ E) $x = -4p^2$

Q:-36 The order of the symmetric group of degree 7 is _____
 A) 5040 B) 49 C) 7 D) 120 E) 70

Q:-37 Let G be a cyclic group of order 36 generated by a, then the order of a^9 is _____
 A) 8 B) 6 C) 4 D) 3 E) 2

Q:-38 If $\alpha = (1\ 5\ 2\ 4)$ and $\beta = (1\ 6)(5\ 4)$ then $\alpha^2\beta =$ _____
 A) (1 5) B) (1 2 6) C) (1 4)
 D) (1 2 5) E) (2 4)

Q:-39 A rolling motion is caused by friction.
 A) Kinetic B) Static C) Kinematic
 D) Absent E) limiting

Q:-40 $\int \frac{x}{(5 + 3x^2)^{3/2}} dx =$ _____
 A) $\frac{1}{2}(5 + 3x^2)^{1/2} + C$ B) $\frac{1}{2}(6 + 3x^2)^{1/2} + C$ C) $\frac{1}{2}(7 + 3x^2)^{1/2} + C$

- D) $\frac{1}{2}(5 + 32)^{\frac{1}{2}} + C$ E) None of these

Q:-41 The equation of a line in which $x \rightarrow \infty$ as $y \rightarrow a$ then this is called _____ Asymptote.

- A) Vertical B) Horizontal C) Straight
 D) None of these

Q:-42 The point on which derivative of a function is zero is called -----point.

- A) Null B) Critical C) Maximum
 D) Minimum E) None of these

Q:-43 The transverse component of velocity is

- A) \dot{r} B) $r\dot{\theta}$ C) zero
 D) $r^2\dot{\theta}$ E) $r(\dot{\theta})^2$

Q:-44 The minimum value of $(1/x)^{1/x}$ is

- A) $e^{\frac{1}{e}}$ B) $e^{-\frac{1}{e}}$ C) $e^{\frac{2}{e}}$
 D) $e^{-\frac{2}{e}}$ E) None of these

Q:-45 The point of inflection of $y = x^3 - 2$ is

- A) (0, 2) B) (0, -3) C) (0, -2)
 D) (0, -4) E) None of these

Q:-46 If $f(x,y) > 0$ then $\iint f(x,y) dA$ represents-----.

- A) Area B) Volume C) surface
 D) None of these

Q:-47 If $f(x, y, z) = 0$ implies $f(-x, y, z) = 0$ then surface is symmetric w.r.t

- A) x-axis B) yz-plane C) y-axis
 D) xz-plane E) None of these

Q:-48 $\lim_{x \rightarrow 1} \frac{\ln x}{\cos \frac{\pi x}{2}}$ =

- A) $\frac{-2}{\pi}$ B) $\frac{2}{\pi}$ C) $\frac{-4}{\pi}$
 D) $\frac{-6}{\pi}$ E) None of these

Q:-49 $\lim_{x \rightarrow 5} (x - 5)^{5x - 25}$ =

- A) 1 B) 2 C) 3
 D) 4 E) None of these

Q:-50 By Maclaurin's $e^{\sin x}$

- A) $1 + x + \frac{x^2}{4} - \frac{x^4}{8} - \frac{x^5}{15} - \dots$ (B)
 B) $1 + x + \frac{x^2}{6} - \frac{x^4}{8} - \frac{x^5}{15} - \dots$
 C) $1 + x + \frac{x^2}{2} - \frac{x^4}{8} - \frac{x^5}{15} - \dots$ D) $1 + x + \frac{x^2}{8} - \frac{x^4}{8} - \frac{x^5}{15} - \dots$

Q:-51 Is $f(x, y) = \frac{x^3 - y^3}{x - y}$ a homogeneous function?

- A) Yes B) No C) May be
 D) None of these

Q:-52 The Wronskian of two solutions of second order linear homogenous DE is zero iff solutions are

- A) Linearly independent B) Unique C) Both are zero
 D) Linearly dependent E) Infinite

$$A = \begin{bmatrix} 1 & 2 & 4 & 7 \\ 0 & 3 & 5 & 8 \\ 0 & 0 & 6 & 9 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Q:-53 If $A = \begin{bmatrix} 1 & 2 & 4 & 7 \\ 0 & 3 & 5 & 8 \\ 0 & 0 & 6 & 9 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ then $\det(A) =$ _____

- A) 36 B) 18 C) 27
 D) 35 E) 40

Q:-54 _____ is not a subspace of \mathbf{R}^3 .

- A) $\{(a, b, c): a = 0\}$ B) $\{(a, b, c): a - b = b + c\}$
 C) $\{(a, b, c): a = b + c\}$ D) $\{(a, b, c): a = b + 2\}$
 E) None of these

Q:-55 _____ is a basis for \mathbf{R}^2 .

- A) $\{(1, 2), (5, 6)\}$ B) $\{(1, 2), (2, 1), (3, 2)\}$
 C) $\{(1, 3), (2, 6)\}$ D) $\{(2, 4)\}$ E) $\{(1, 3), (-1, -3)\}$

Q:-56 Find y' where $y = \sin^{-1}(ax + b)$

- A) $\frac{2a}{\sqrt{1 - (ax + b)^2}}$ B) $\frac{a}{\sqrt{1 - (ax + b)^2}}$ C)
 $\frac{3a}{\sqrt{1 - (ax + b)^2}}$
 D) $\frac{a}{\sqrt{1 - (2ax + b)^2}}$ E) None of these

Q:- 57. $\int \frac{dx}{1 - x^2} =$

- A) $\frac{1}{2} \ln b \left| \frac{1+x}{1-x} \right|$ B) $\frac{1}{2} \ln c \left| \frac{1+x}{1-x} \right|$ C) $\frac{1}{2} \ln a \left| \frac{1+x}{1-x} \right|$
 D) $\frac{1}{4} \ln a \left| \frac{1+x}{1-x} \right|$ E) None of these

Q:-58 $\lim_{x \rightarrow 0} \frac{x - \sin^{-1} x}{(\sin[x])^3} =$

- A) $\frac{1}{6}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$
 D) $\frac{1}{2}$ E) None of these

Q:-59 In simple harmonic motion acceleration is always directed towards

- A) An axis B) A line C) A plane

- D) A particle E) A fixed point

Q:-60 $\mathcal{L}\{u_a(t)f(t-a)\} =$

- A) $\frac{e^{-as}F(s)}{s+a}$ B) $e^{as}F(s)$ C) $\frac{F(s-a)}{s-a}$
 D) $\frac{F(s-a)}{s+a}$ E) $\frac{F(s)}{a}$

Q:-61 Particular solution of the DE $(D^3 - 2D + 1)y = 2x^3 - 3x^2 + 4x + 5$ is

- A) $2x^3 + 9x^2 + 40x + 73$ B) $3x^2 - 6x + 4$
 C) $x^4/2 - x^3 + 2x^2 + 5x$ D) $2x^3 - 3x^2 + 4x + 5$
 E) None of these

Q:-62 $\lim_{x \rightarrow 0} \frac{e^x - (x+1)}{x(e^x - 1)} =$

- A) $\frac{1}{4}$ B) $\frac{1}{6}$ C) $\frac{1}{8}$
 D) $\frac{1}{2}$ E) None of these

Q:-63 The asymptotes of the curve $y = x + \ln x$ is

- A) $x = a$ B) $x = b$ C) $x = 0$
 D) $x = -a$ E) None of these

Q:-64 Sum of n nth root of unity is _____

- A) 1 B) Zero C) n
 D) $2n\pi$ E) $\frac{\pi}{2}$

Q:-65 If the intersecting plane is parallel to a generator of the cone, but intersects its one nape only, the curve of intersection is a

- A) Circle B) Parabola C) Line
 D) Hyperbola E) None of these

Q:-66 Imaginary part of $\text{Log}(1-i)$

- A) $\frac{3\pi}{4}$ B) $-\frac{3\pi}{4}$ C) $\frac{\pi}{4}$
 D) $-\frac{\pi}{4}$ E) None of these

Q:-67 The range of the function $f = \{(x, \cos^{-1}x) / x \in R\}$ is

- A) $(-1, 1)$ B) $(-2, 1)$ C) $(-2, 2)$
 D) $[-1, 1]$ E) None of these

Q:-68 The integral $\int_{-\pi/4}^{\pi/4} \frac{dt}{\sin t}$ is

- A) Divergent B) Convergent C) Non-divergent
 D) Non-Convergent E) None of these

Q:-69 The area bounded by the curve $9x^2 + x = 2$ and the y-axis is

- A) $\frac{6\sqrt{2}}{9}$ B) $\frac{0\sqrt{2}}{9}$ C) $\frac{10\sqrt{2}}{9}$
 D) $\frac{8\sqrt{2}}{9}$ E) None of these

Q:-70 i^i equals to

- A) $e^{-\frac{\pi}{2}}$ B) $e^{\frac{\pi}{2}}$ C) $e^{-\frac{3\pi}{2}}$
 D) $e^{\frac{3\pi}{2}}$ E) None of these

Section II: English

Choose the synonyms of the following words:

Q:-71 Ability

- A) capability B) competence C) plenty D) failure

Q:-72 Blame

- A) pending B) delegation C) reproof D) censure

Q:-73 Efficiency

- A) haggle B) capability C) potency D) departure

Q:-74 Excess

- A) superfluity B) subsequent C) steer D) surplus

Q:-75 Complex

- A) complicated B) intricate C) disaster D) bid

Choose the synonyms of the following words:

Q:-76 Lack

- A) evasion B) deficiency C) scarcity D) silent

Q:-77 Sin

- A) crime B) vice C) wild D) dry

Q:-78 Silly

- A) campaign B) foolish C) peace D) tranquility

Q:-79 Agreeable

- A) conformable B) concur C) accede D) wages

Q:-80 Decide

- A) lobby B) resolve C) lie D) determine

In the following questions, a related pair of words or phrase is followed by 4 lettered pair of words or phrase. Select the best answer.

Q:-81 Man is to run as bird is to _____.

A) run B) weak C) walk D) fly

Q:-82 Masor: Wall::

A) Artist: easel B) Sculptor: mallet
C) Author: book D) Fisherman: trout

Q:-83 Watch is to time as thermometer is to _____.

A) temperature B) heat C) mercury D) cover

Q:-84 Minister: Pulpit::

A) Doctor: patient B) Judge: bench
C) Student: teacher D) Programmer: logic

Q:-85 Auger: Carpenter::

A) Cement: mason B) Apron: chef
C) Awl: cobbler D) Studio: sculptor

Q:-86 Father is to son as mother is to _____.

A) Sister B) Aunt C) Mummy D) Daughter

Q:-87 Ring is to finger as watch is to _____.

A) Arm B) Wrist C) Foot D) Head

Q:-88 Elm: Tree

A) Whale: mammal B) Cart: horse
C) Cloud: rain D) Painting: artist

Q:-89 Gullible: Duped::

A) Myopic: misled B) Careful: cautioned
C) Cloud: rain D) Credible: cheated

Q:-90 Bed is to sleep as chair is to _____.

A) Sit B) Wood C) Seat D) Floor

Choose the word which best completes each sentence.

Q:-91 We lost confidence in Salim because he never _____ the grandiose promises he had made.

A) tired of B) delivered on C) retreated from D) forgot about

Q:-92 The driver suddenly applied the brakes when he saw a _____ truck ahead of him.

A) stationary B) moving C) static D) immobile

Q:-93 Knowledge is like a deep well fed by _____ springs, and your mind in the little bucket that you drop in it.

A) external B) perennial C) immortal D) inehaustible

Q:-94 Salma is much too _____ to have anything to do with that obnoxious affair.

A) noble B) proud C) happy D) difficult

- Q:-95 there is no incentive for America to sign the treaty since there is every reason to _____ no other nation intends to honour its provisions.
A) regret B) inform C) believe D) occupy
- Q:-96 A legislation was passed to punish brokers who _____ their clients funds.
A) defalcate B) devastate C) devour D) embezzle
- Q:-97 Normally an individual thunderstorm _____ about 45 minutes.
A) lasts B) ends C) remains D) continues
- Q:-98 The task seemed impossible but somehow Jalil _____ very skillfully in the end.
A) pulled it up B) pulled it off
C) pulled it away D) pulled it out
- Q:-99 The unruly behavior of the children _____ their parents.
A) aggrieved B) impeached C) incensed D) tempered
- Q:-100 We were amazed that a man who had been heretofore the most _____ of public speakers could, in a single speech, electrify an audience and bring them cheering.
A) Pedestrian B) accomplished C) masterful D) auspicious