SUBJECT : MATHEMATICS	DAY – 1
SESSION : AFTERNOON	TIME : 02.30 P.M. TO 03.50 P.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER					QUESTION BOOKLET DETAILS	
					VERSION CODE	SERIAL NUMBER
					A - 1	310545

DOs :

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the 2nd **Bell i.e., after 2.30 p.m.**
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS :

1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. **The 3rd Bell rings at 2.40 p.m., till then;**
   - Do not remove the paper seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have one statement and four distracters. (Four different options / choices.)
2. After the 3rd **Bell is rung at 2.40 p.m.,** remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   - Read each question carefully.
   - Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

Correct Method of shading the circle on the OMR answer sheet is as shown below :

① ● ③ ④

4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell is rung at 3.50 p.m.,** stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the **OMR ANSWER SHEET** to the room invigilator as it is.
8. After separating the top sheet (Our Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

SEAL

1. If $\frac{(x+1)^2}{x^3+x} = \frac{A}{x} + \frac{Bx+C}{x^2+1}$, then

$\sin^{-1} A + \tan^{-1} B + \sec^{-1} C =$ ________

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{6}$

(3) 0 (4) $\frac{5\pi}{6}$

2. The sum of the series,

$\frac{1}{2.3} \cdot 2 + \frac{2}{3.4} \cdot 2^2 + \frac{3}{4.5} \cdot 2^3 + \ldots\ldots\ldots.$ to n terms is ________

(1) $\frac{2^{n+1}}{n+2} + 1$ (2) $\frac{2^{n+1}}{n+2} - 1$

(3) $\frac{2^{n+1}}{n+2} + 2$ (4) $\frac{2^{n+1}}{n+2} - 2$

3. If the roots of the equation $x^3 + ax^2 + bx + c = 0$ are in A.P., then $2a^3 - 9ab =$ ________

(1) 9c (2) 18c

(3) 27c (4) –27c

4. If the value of

$C_0 + 2 \cdot C_1 + 3 \cdot C_2 + \ldots\ldots\ldots. + (n+1) \cdot C_n = 576$, then n is ________

(1) 7 (2) 5

(3) 6 (4) 9

Space For Rough Work

5. The inverse of the proposition $(p \wedge \sim q) \rightarrow r$ is ________

(1) $(\sim r) \longrightarrow (\sim p) \vee q$
(2) $(\sim p) \vee q \longrightarrow (\sim r)$
(3) $r \longrightarrow p \wedge (\sim q)$
(4) $(\sim p) \vee (\sim q) \longrightarrow r$

6. The range of the function $f(x) = \sin [x]$, $-\frac{\pi}{4} < x < \frac{\pi}{4}$ where $[x]$ denotes the greatest integer $\leq x$, is ________

(1) $\{0\}$
(2) $\{0, -1\}$
(3) $\{0, \pm \sin 1\}$
(4) $\{0, -\sin 1\}$

7. If the line $6x - 7y + 8 + \lambda(3x - y + 5) = 0$ is parallel to y-axis, then $\lambda =$ ________

(1) -7
(2) -2
(3) 7
(4) 2

8. The angle between the lines $\sin^2\alpha \cdot y^2 - 2xy \cdot \cos^2 \alpha + (\cos^2 \alpha - 1)x^2 = 0$ is ________

(1) $90°$
(2) α
(3) $\frac{\alpha}{2}$
(4) 2α

9. The minimum area of the triangle formed by the variable line $3 \cos \theta \cdot x + 4 \sin \theta \cdot y = 12$ and the co-ordinate axes is ________

(1) 144
(2) $\frac{25}{2}$
(3) $\frac{49}{4}$
(4) 12

Space For Rough Work

10. log (sin 1°) · log(sin 2°) · log(sin 3°) .... log(sin 179°)

(1) is positive
(2) is negative
(3) lies between 1 and 180
(4) is zero

11. If $\sin x - \sin y = \frac{1}{2}$ and $\cos x - \cos y = 1$, then $\tan(x + y) =$ ________

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

12. In a triangle ABC, if $\frac{\cos A}{a} = \frac{\cos B}{b} = \frac{\cos C}{c}$ and a = 2, then its area is ________

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

13. $\lim_{x \to 0} \frac{\log_e (1 + x)}{3^x - 1} =$ ________

(1) $\log_e 3$
(2) 0
(3) $\log_3 e$
(4) 1

Space For Rough Work

14. Let $f(x) = \begin{cases} x, & \text{if } x \text{ is irrational} \\ 0 & \text{if } x \text{ is rational} \end{cases}$

then f is ________

(1) continuous everywhere
(2) discontinuous everywhere
(3) continuous only at $x = 0$
(4) continuous at all rational numbers

15. In a regular graph of 15 vertices the sum of the degree of the vertices is 60. Then the degree of each vertex is ________

(1) 5
(2) 3
(3) 4
(4) 2

16. The remainder when,

$10^{10} \cdot (10^{10} + 1)(10^{10} + 2)$ is divided by 6 is ________

(1) 2
(2) 4
(3) 0
(4) 6

17. A value of x satisfying $150\,x \equiv 35 \pmod{31}$ is ________

(1) 14
(2) 22
(3) 24
(4) 12

18. The smallest positive divisor greater than 1 of a composite number 'a' is ________

(1) $< \sqrt{a}$
(2) $= \sqrt{a}$
(3) $> \sqrt{a}$
(4) $\leq \sqrt{a}$

Space For Rough Work

19. If A and B are square matrices of order 'n' such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will be true ?

(1) Either of A or B is zero matrix.

(2) A = B

(3) AB = BA

(4) Either of A or B is an identity matrix.

20. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 125$, then $\alpha =$ ________

(1) ± 1 (2) ± 2

(3) ± 3 (4) ± 5

21. If $A = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$ and $B = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$, then $\frac{dA}{dx} =$ ________

(1) 3B + 1 (2) 3B

(3) –3B (4) 1 – 3B

22. If the determinant of the adjoint of a (real) matrix of order 3 is 25, then the determinant of the inverse of the matrix is

(1) 0.2 (2) ± 5

(3) $\frac{1}{\sqrt[5]{625}}$ (4) ± 0.2

Space For Rough Work

23. If the matrix $\begin{bmatrix} 2 & 3 \\ 5 & -1 \end{bmatrix}$ = A + B, where A is symmetric and B is skew symmetric, then B = ________

(1) $\begin{bmatrix} 2 & 4 \\ 4 & -1 \end{bmatrix}$
(2) $\begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$
(3) $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$
(4) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

24. In a group (G, ∗), for some element 'a' of G, if $a^2 = e$, where e is the identity element, then

(1) $a = a^{-1}$
(2) $a = \sqrt{e}$
(3) $a = \frac{1}{a^2}$
(4) $a = e$

25. In the group (Z, ∗), if $a * b = a + b - n \ \forall \ a, b \in Z$, where n is a fixed integer, then the inverse of (–n) is ________

(1) n
(2) –n
(3) –3n
(4) 3n

26. If $\vec{a} = (1, 2, 3)$, $\vec{b} = (2, -1, 1)$, $\vec{c} = (3, 2, 1)$ and $\vec{a} \times (\vec{b} \times \vec{c}) = \alpha\vec{a} + \beta\vec{b} \times \gamma\vec{c}$, then

(1) $\alpha = 1, \beta = 10, \gamma = 3$
(2) $\alpha = 0, \beta = 10, \gamma = -3$
(3) $\alpha + \beta + \gamma = 8$
(4) $\alpha = \beta = \gamma = 0$

27. If $\vec{a} \perp \vec{b}$ and $(\vec{a} + \vec{b}) \perp (\vec{a} + m\vec{b})$, then m = ________

(1) –1
(2) 1
(3) $\frac{-|\vec{a}|^2}{|\vec{b}|^2}$
(4) 0

Space For Rough Work

28. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, then $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a} =$ ______

(1) $\frac{3}{2}$ (2) $-\frac{3}{2}$

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

29. If $\vec{a}$ is vector perpendicular to both $\vec{b}$ and $\vec{c}$, then

(1) $\vec{a} \cdot (\vec{b} \times \vec{c}) = 0$ (2) $\vec{a} \times (\vec{b} \times \vec{c}) = \vec{0}$

(3) $\vec{a} \times (\vec{b} + \vec{c}) = \vec{0}$ (4) $\vec{a} + (\vec{b} + \vec{c}) = \vec{0}$

30. A tangent is drawn to the circle $2x^2 + 2y^2 - 3x + 4y = 0$ at the point 'A' and it meets the line $x + y = 3$ at B(2, 1), then AB = ______

(1) $\sqrt{10}$ (2) 2

(3) $2\sqrt{2}$ (4) 0

31. The area of the circle having its centre at (3, 4) and touching the line $5x + 12y - 11 = 0$ is ______

(1) 16π sq. units (2) 4π sq. units

(3) 12π sq. units (4) 25π sq. units

32. The number of real circles cutting orthogonally the circle $x^2 + y^2 + 2x - 2y + 7 = 0$ is ______

(1) 0 (2) 1

(3) 2 (4) infinitely many

Space For Rough Work

33. The length of the chord of the circle $x^2 + y^2 + 3x + 2y - 8 = 0$ intercepted by the y-axis is

(1) 3
(2) 8
(3) 9
(4) 6

34. $A \equiv (\cos \theta, \sin \theta)$, $B \equiv (\sin \theta, -\cos \theta)$ are two points. The locus of the centroid of ΔOAB, where 'O' is the origin is ________

(1) $x^2 + y^2 = 3$
(2) $9x^2 + 9y^2 = 2$
(3) $2x^2 + 2y^2 = 9$
(4) $3x^2 + 3y^2 = 2$

35. The sum of the squares of the eccentricities of the conics $\frac{x^2}{4} + \frac{y^2}{3} = 1$ and $\frac{x^2}{4} - \frac{y^2}{3} = 1$ is ________

(1) 2
(2) $\sqrt{\frac{7}{3}}$
(3) $\sqrt{7}$
(4) $\sqrt{3}$

36. The equation of the tangent to the parabola $y^2 = 4x$ inclined at an angle of $\frac{\pi}{4}$ to the +ve direction of x-axis is ________

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

37. If the distance between the foci and the distance between the directrices of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are in the ratio 3 : 2, then a : b is ________

(1) $\sqrt{2} : 1$
(2) $1 : 2$
(3) $\sqrt{3} : \sqrt{2}$
(4) $2 : 1$

Space For Rough Work

38. If the area of the auxillary circle of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (a > b) is twice the area of the ellipse, then the eccentricity of the ellipse is ______

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

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

39. $\cos\left[2\cos^{-1}\frac{1}{5} + \sin^{-1}\frac{1}{5}\right] =$ ______

(1) $\frac{1}{5}$ (2) $\frac{-2\sqrt{6}}{5}$

(3) $-\frac{1}{5}$ (4) $\frac{\sqrt{6}}{5}$

40. The value of $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$, $x, y > 0$ is

(1) $\frac{\pi}{4}$ (2) $-\frac{\pi}{4}$

(3) $\frac{\pi}{2}$ (4) $-\frac{\pi}{2}$

41. The general solution of $\sin x - \cos x = \sqrt{2}$, for any integer 'n' is ______

(1) $2n\pi + \frac{3\pi}{4}$ (2) $n\pi$

(3) $(2n + 1)\pi$ (4) $2n\pi$

Space For Rough Work

42. The modulus and amplitude of $\frac{1+2i}{1-(1-i)^2}$ are ______

(1) $\sqrt{2}$ and $\frac{\pi}{6}$

(2) 1 and $\frac{\pi}{4}$

(3) 1 and 0

(4) 1 and $\frac{\pi}{3}$

43. If $2x = -1 + \sqrt{3}i$, then the value of $(1 - x^2 + x)^6 - (1 - x + x^2)^6 =$ ______

(1) 32

(2) 64

(3) –64

(4) 0

44. If $x + y = \tan^{-1} y$ and $\frac{d^2y}{dx^2} = f(y)\ \frac{dy}{dx}$, then f(y) = ______

(1) $\frac{-2}{y^3}$

(2) $\frac{2}{y^3}$

(3) $\frac{1}{y}$

(4) $\frac{-1}{y}$

45. $f(x) = \begin{cases} 2a - x \text{ when } -a < x < a \\ 3x - 2a \text{ when } a \leq x \end{cases}$

Then which of the following is true ?

(1) f(x) is not differentiable at x = a.

(2) f(x) is discontinuous at x = a.

(3) f(x) is continuous for all x < a.

(4) f(x) is differentiable for all $x \geq$ a.

Space For Rough Work

46. Let $f(x) = \cos^{-1}\left[\frac{1}{\sqrt{13}}(2\cos x - 3\sin x)\right]$. Then $f'(0.5) =$ ________

(1) 0.5
(2) 1
(3) 0
(4) −1

47. If $f(x)$ is a function such that $f''(x) + f(x) = 0$ and $g(x) = [f(x)]^2 + [f'(x)]^2$ and $g(3) = 8$, then $g(8) =$ ________

(1) 0
(2) 3
(3) 5
(4) 8

48. If $f(x) = f'(x) + f''(x) + f'''(x) + \ldots\ldots\ldots\ldots$ and $f(0) = 1$, then $f(x) =$ ________

(1) $e^{\frac{x}{2}}$
(2) e^{x}
(3) e^{2x}
(4) e^{4x}

49. The function $f(x) = \frac{x}{3} + \frac{3}{x}$ decreases in the interval

(1) $(-3, 3)$
(2) $(-\infty, 3)$
(3) $(3, \infty)$
(4) $(-9, 9)$

Space For Rough Work

50. If $\sin^{-1} a$ is the acute angle between the curves $x^2 + y^2 = 4x$ and $x^2 + y^2 = 8$ at (2, 2), then a = ________

(1) 1
(2) 0
(3) $\frac{1}{\sqrt{2}}$
(4) $\frac{\sqrt{3}}{2}$

51. The maximum area of a rectangle that can be inscribed in a circle of radius 2 units is ________

(1) 8π sq. units
(2) 4 sq. units
(3) 5 sq. units
(4) 8 sq. units

52. If the length of the sub-tangent at any point to the curve $xy^n = a$ is proportional to the abscissa, then 'n' is ________

(1) any non-zero real number
(2) 2
(3) –2
(4) 1

53. $\int \frac{\cos^{n-1} x}{\sin^{n+1} x} dx, n \neq 0$ is ________

(1) $\frac{\cot^n x}{n}$
(2) $\frac{-\cot^{n-1} x}{n-1}$
(3) $\frac{-\cot^n x}{n}$
(4) $\frac{\cot^{n-1} x}{n-1}$

Space For Rough Work

54. $\int \frac{(x-1)\,e^x}{(x+1)^3}\,dx =$ ________

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

(3) $\frac{e^x}{(x+1)^3}$ (4) $\frac{x \cdot e^x}{(x+1)}$

55. If $I_1 = \int_0^{\pi/2} x \cdot \sin x \, dx$ and

$I_2 = \int_0^{\pi/2} x \cdot \cos x \, dx$, then which one of the following is true ?

(1) $I_1 = I_2$ (2) $I_1 + I_2 = 0$

(3) $I_1 = \frac{\pi}{2} \cdot I_2$ (4) $I_1 + I_2 = \frac{\pi}{2}$

56. The value of $\int_{-1}^{2} \frac{|x|}{x}\,dx$ is ________

(1) 0 (2) 1

(3) 2 (4) 3

Space For Rough Work

57. $\int_{0}^{\pi} \frac{\cos^4 x}{\cos^4 x + \sin^4 x} dx =$ ________

(1) $\frac{\pi}{4}$

(2) $\frac{\pi}{2}$

(3) $\frac{\pi}{8}$

(4) π

58. The area bounded by the curve $y = \sin\left(\frac{x}{3}\right)$, x-axis and lines $x = 0$ and $x = 3\pi$ is ________

(1) 9

(2) 0

(3) 6

(4) 3

59. The general solution of the differential equation $\sqrt{1 - x^2 y^2} \cdot dx = y \cdot dx + x \cdot dy$ is ________

(1) $\sin(xy) = x + c$

(2) $\sin^{-1}(xy) + x = c$

(3) $\sin(x + c) = xy$

(4) $\sin(xy) + x = c$

60. If 'm' and 'n' are the order and degree of the differential equation $(y'')^5 + 4 \cdot \frac{(y'')^3}{y'''} + y''' = \sin x$, then

(1) $m = 3, n = 5$

(2) $m = 3, n = 1$

(3) $m = 3, n = 3$

(4) $m = 3, n = 2$

Space For Rough Work

SEAL

A-1