AglaSem Admission

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	330849

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.

1. $f(x) = \frac{1}{2} - \tan\left(\frac{\pi x}{2}\right) \quad -1 < x < 1$

and $g(x) = \sqrt{(3 + 4x - 4x^2)}$.

Find domain of (f + g)

(1) $\left[\frac{-1}{2}, 1\right)$

(2) $\left(\frac{-1}{2}, 1\right]$

(3) $\left[-\frac{1}{2}, \frac{3}{2}\right]$

(4) (–1, 1)

2. Write the set builder form A = {–1, 1}

(1) A = {x : x is a real number}

(2) A = {x : x is an integer}

(3) A = {x : x is a root of the equation $x^2 = 1$}

(4) A = {x : x is a root of the equation $x^2 + 1 = 0$}

3. If the operation ⊕ is defined by $a \oplus b = a^2 + b^2$ for all real numbers 'a' and 'b', then $(2 \oplus 3) \oplus 4 =$ ______

(1) 181

(2) 182

(3) 184

(4) 185

4. If $Z = \frac{(\sqrt{3} + i)^3 (3i + 4)^2}{(8 + 6i)^2}$, then $|Z|$ is equal to

(1) 0

(2) 1

(3) 2

(4) 3

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5. If α and β are the roots of $x^2 - ax + b^2 = 0$, then $\alpha^2 + \beta^2$ is equal to ____

(1) $a^2 - 2b^2$ (2) $2a^2 - b^2$

(3) $a^2 - b^2$ (4) $a^2 + b^2$

6. If the 2^{nd} and 5^{th} terms of G.P. are 24 and 3 respectively, then the sum of 1^{st} six terms is ____

(1) $\frac{189}{2}$ (2) $\frac{189}{5}$

(3) $\frac{179}{2}$ (4) $\frac{2}{189}$

7. The middle term of expansion of $\left(\frac{10}{x} + \frac{x}{10}\right)^{10}$

(1) ${}^{7}C_5$ (2) ${}^{8}C_5$

(3) ${}^{9}C_5$ (4) ${}^{10}C_5$

8. If $\begin{vmatrix} 2a & x_1 & y_1 \\ 2b & x_2 & y_2 \\ 2c & x_3 & y_3 \end{vmatrix} = \frac{abc}{2} \neq 0$, then the area of the triangle whose vertices are $\left(\frac{x_1}{a}, \frac{y_1}{a}\right)$, $\left(\frac{x_2}{b}, \frac{y_2}{b}\right)$, $\left(\frac{x_3}{c}, \frac{y_3}{c}\right)$ is

(1) $\frac{1}{4}abc$ (2) $\frac{1}{8}abc$

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

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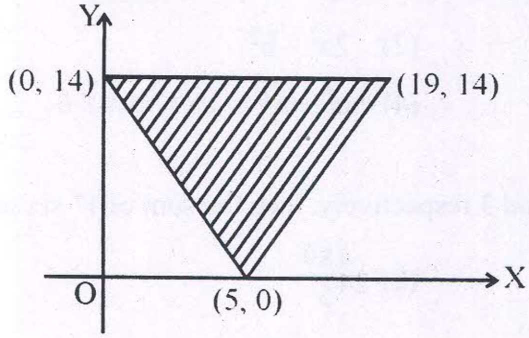
9. The shaded region shown in fig. is given by the inequation



(1) $14x + 5y \geq 70 \quad y \leq 14$ and $x - y \leq 5$

(2) $14x + 5y \geq 70 \quad y \leq 14$ and $x - y \geq 5$

(3) $14x + 5y \leq 70 \quad y \leq 14$ and $x - y \geq 5$

(4) $14x + 5y \geq 70 \quad y \geq 14$ and $x - y \geq 5$

10. $\sim [(-p) \wedge q]$ is logically equivalent to

(1) $p \vee (\sim q)$ (2) $p \wedge (\sim q)$

(3) $\sim [p \wedge (\sim q)]$ (4) $\sim (p \vee q)$

11. The value of

$\sin^{-1}\left(\frac{2\sqrt{2}}{3}\right) + \sin^{-1}\left(\frac{1}{3}\right)$ is equal to

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

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

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12. If the eccentricity of the hyperbola

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \text{ is } \frac{5}{4} \text{ and } 2x + 3y - 6 = 0$$

is a focal chord of the hyperbola, then the length of transverse axis is equal to ___

(1) $\frac{12}{5}$ (2) $\frac{24}{5}$

(3) $\frac{6}{5}$ (4) $\frac{5}{24}$

13. If $\vec{a} = i + 2j + 2k$, $|\vec{b}| = 5$ and the angle between $\vec{a}$ and $\vec{b}$ is $\frac{\pi}{6}$, then the area of the triangle formed by these two vectors as two sides is

(1) $\frac{15}{2}$ (2) 15

(3) $\frac{15}{4}$ (4) $\frac{15\sqrt{3}}{2}$

14. Let $\vec{a} = i - 2j + 3k$ if $\vec{b}$ is a vector such that $\vec{a} \cdot \vec{b} = |\vec{b}|^2$ and $|\vec{a} - \vec{b}| = \sqrt{7}$, then $|\vec{b}| =$ ____

(1) 7 (2) 14

(3) $\sqrt{7}$ (4) 21

15. If direction cosines of a vector of magnitude 3 are $\frac{2}{3}, -\frac{9}{3}, \frac{2}{3}$ and a > 0, then vector is ____

(1) $2i + j + 2k$ (2) $2i - j + 2k$

(3) $i - 2j + 2k$ (4) $i + 2j + 2k$

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16. Equation of line passing through the point (2, 3, 1) and parallel to the line of intersection of the plane $x - 2y - z + 5 = 0$ and $x + y + 3z = 6$ is

(1) $\frac{x-2}{5} = \frac{y-3}{-4} = \frac{z-1}{3}$ (2) $\frac{x-2}{-5} = \frac{y-3}{-4} = \frac{z-1}{3}$

(3) $\frac{x-2}{5} = \frac{y-3}{4} = \frac{z-1}{3}$ (4) $\frac{x-2}{4} = \frac{y-3}{3} = \frac{z-1}{2}$

17. Foot of perpendicular drawn from the origin to the plane $2x - 3y + 4z = 29$ is ____

(1) (5, –1, 4) (2) (2, –3, 4)

(3) (7, –1, 3) (4) (5, –2, 3)

18. If two dice are thrown simultaneously, then the probability that the sum of the numbers which come up on the dice to be more than 5 is ____

(1) $\frac{5}{36}$ (2) $\frac{1}{6}$

(3) $\frac{5}{18}$ (4) $\frac{13}{18}$

19. If $y = f(x^2 + 2)$ and $f'(3) = 5$, then $\frac{dy}{dx}$ at $x = 1$ is ____

(1) 5 (2) 25

(3) 15 (4) 10

20. If $x = a\cos^3\theta$, $y = a\sin^3\theta$, then $1 + \left(\frac{dy}{dx}\right)^2$ is ____

(1) $\tan\theta$ (2) $\tan^2\theta$

(3) $\sec^2\theta$ (4) 1

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21. Slope of Normal to the curve

$y = x^2 - \frac{1}{x^2}$ at (–1, 0) is

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

(3) 4 (4) – 4

22. $\int \frac{1}{x^2(x^4+1)^{3/4}}\, dx$ is equal to _____

(1) $\frac{-(1+x^4)^{1/4}}{x} + C$ (2) $\frac{-(1+x^4)^{1/4}}{x^2} + C$

(3) $\frac{-(1+x^4)^{1/4}}{2x} + C$ (4) $\frac{-(1+x^4)^{3/4}}{x} + C$

23. If f : R → R is defined by $f(x) = \frac{x}{x^2+1}$, find f(f(2))

(1) $\frac{1}{29}$ (2) $\frac{10}{29}$

(3) $\frac{29}{10}$ (4) 29

24. Evaluate $\begin{vmatrix} \cos 15 & \sin 15 \\ \sin 75 & \cos 75 \end{vmatrix}$

(1) 1 (2) 0

(3) 2 (4) 3

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25. A man takes a step forward with probability 0.4 and one step backward with probability 0.6, then the probability that at the end of eleven steps he is one step away from the starting point is

(1) $^{11}C_5 \times (0.48)^5$ (2) $^{11}C_6 \times (0.24)^5$

(3) $^{11}C_5 \times (0.12)^5$ (4) $^{11}C_6 \times (0.72)^6$

26. $\int_0^{\pi/4} \log\left(\frac{\sin x + \cos x}{\cos x}\right) dx$

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

(3) $\frac{\pi}{8}\log 2$ (4) $\log 2$

27. Area bounded by $y = x^3$, $y = 8$ and $x = 0$ is ____

(1) 2 sq. units (2) 14 sq. units

(3) 12 sq. units (4) 6 sq. units

28. Let $\vec{a} = i + 2j + k$, $\vec{b} = i - j + k$ and $\vec{c} = i + j - k$, a vector in the plane $\vec{a}$ and $\vec{b}$ whose projection on $\vec{c}$ is $\frac{1}{\sqrt{3}}$ is _____

(1) $3i + j - 3k$ (2) $4i + j - 4k$

(3) $i + j - 2k$ (4) $4i - j + 4k$

29. The mean deviation from the data 3, 10, 10, 4, 7, 10, 5 :

(1) 3 (2) 2

(3) 3.75 (4) 2.57

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30. The probability distribution of x is

x	0	1	2	3
$P(x)$	0.2	k	k	2k

find the value of k

(1) 0.2
(2) 0.3
(3) 0.4
(4) 0.1

31. If the function g(x) is defined by

$$g(x) = \frac{x^{200}}{200} + \frac{x^{199}}{199} + \frac{x^{198}}{198} + \text{----} + \frac{x^2}{2} + x + 5, \text{ then } g'(0) = \_\_\_\_$$

(1) 1
(2) 200
(3) 100
(4) 5

32. A box contains 6 red marbles numbers from 1 through 6 and 4 white marbles 12 through 15. Find the probability that a marble drawn 'at random' is white and odd numbered.

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

33. $\lim_{x\to 0} \frac{1 - \cos x}{x^2}$ is _____

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

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34. $f(x) = \begin{cases} 3x - 8 & \text{if } x \leq 5 \\ 2k & \text{if } x > 5 \end{cases}$ is continuous, find k.

(1) $\frac{2}{7}$

(2) $\frac{3}{7}$

(3) $\frac{4}{7}$

(4) $\frac{7}{2}$

35. If $f(x) = 2x^2$, find $\frac{f(3.8) - f(4)}{3.8 - 4}$.

(1) 1.56

(2) 156

(3) 15.6

(4) 0.156

36. If $x = ct$ and $y = \frac{c}{t}$, find $\frac{dy}{dx}$ at t = 2.

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

(2) 4

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

(4) 0

37. A balloon which always remains spherical is being inflated by pumping in 10 cubic centimeters of gas per second. Find the rate at which the radius of the balloon is increasing when the radius is 15 cms.

(1) $\frac{1}{90\pi}$ cm/sec

(2) $\frac{1}{9\pi}$ cm/sec

(3) $\frac{1}{30\pi}$ cm/sec

(4) $\frac{1}{\pi}$ cm/sec

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38. $\int \frac{\sin^2 x}{1+\cos x}\,dx$

(1) $x + \sin x + C$
(2) $x - \sin x + C$
(3) $\sin x + C$
(4) $\cos x + C$

39. $\int e^x \left(\frac{1+\sin x}{1+\cos x}\right) dx$ is ____

(1) $e^x \tan\left(\frac{x}{2}\right) + C$
(2) $\tan\left(\frac{x}{2}\right) + C$
(3) $e^x + C$
(4) $e^x \sin x + C$

40. If 1, w, w^2 are three cube roots of unity, then $(1 - w + w^2)(1 + w - w^2)$ is ____

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

41. Solve for x

$\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2}\tan^{-1} x, x > 0$

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

42. The system of linear equations $x + y + z = 6$, $x + 2y + 3z = 10$ and $x + 2y + az = b$ has no solutions when ____

(1) $a = 2 \quad b \neq 3$
(2) $a = 3 \quad b \neq 10$
(3) $b = 2 \quad a = 3$
(4) $b = 3 \quad a \neq 10$

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43. The value of tan(1°) + tan(89°) is ____

(1) $\frac{1}{\sin(1^\circ)}$ (2) $\frac{2}{\sin(2^\circ)}$

(3) $\frac{2}{\sin(1^\circ)}$ (4) $\frac{1}{\sin(2^\circ)}$

44. If $\frac{(x+1)^2}{x^3+x} = \frac{A}{x} + \frac{Bx+C}{x^2+1}$, then $\operatorname{cosec}^{-1}\left(\frac{1}{A}\right) + \cot^{-1}\left(\frac{1}{B}\right) + \sec^{-1} C =$ ____

(1) $\frac{5\pi}{6}$ (2) 0

(3) $\frac{\pi}{6}$ (4) $\frac{\pi}{2}$

45. The remainder obtained when 1! + 2! + 3! + ⋯ + 11! is divided by 12 is ____

(1) 9 (2) 8

(3) 7 (4) 6

46. If $\alpha \leq 2\sin^{-1} x + \cos^{-1} x \leq \beta$, then

(1) $\alpha = \frac{-\pi}{2}$ $\beta = \frac{\pi}{2}$ (2) $\alpha = \frac{-\pi}{2}$ $\beta = \frac{3\pi}{2}$

(3) $\alpha = 0$ $\beta = \pi$ (4) $\alpha = 0$ $\beta = 2\pi$

47. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then A^2 equal to ____

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

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

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48. The function $f(x) = [x]$, where $[x]$ denotes greatest integer function is continuous at ____

(1) 4 (2) –2

(3) 1 (4) 1.5

49. If $y = \log\left(\frac{1-x^2}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal to ____

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

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

50. The two curves $x^3 - 3xy^2 + 2 = 0$ and $3x^2y - y^3 = 2$

(1) touch each other (2) cut at right angle

(3) cut at angle $\frac{\pi}{3}$ (4) cut at angle $\frac{\pi}{4}$

51. If x is real, then the minimum value of $x^2 - 8x + 17$ is ____

(1) 1 (2) 2

(3) 3 (4) 4

52. $\int_{-\pi/4}^{\pi/4} \frac{dx}{1 + \cos 2x}$ is equal to

(1) 2 (2) 1

(3) 4 (4) 0

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53. The order of differential equation of all circles of given radius 'a' is ______

(1) 4 (2) 2

(3) 1 (4) 3

54. The solution of differential equation

$x\frac{dy}{dx} + 2y = x^2$ is _____

(1) $y = \frac{x^2 + C}{4x^2}$ (2) $y = \frac{x^2}{4} + C$

(3) $y = \frac{x^4 + C}{x^2}$ (4) $y = \frac{x^4 + C}{4x^2}$

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

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

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

56. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 27$, then $\alpha =$ _____

(1) ± 1 (2) ± 2

(3) $\pm\sqrt{7}$ (4) $\pm\sqrt{5}$

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57. If $P = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$ and $Q = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$, then $\frac{dQ}{dx} =$ ____

(1) 3P + 1 (2) 1 – 3P

(3) – 3P (4) 3P

58. A line passes through (2, 2) and is perpendicular in the line $3x + y = 3$ its y-intercepts is ____

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

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

59. Let $f : R \to R$ be defined by $f(x) = \frac{1}{x}$ $\forall x \in R$, then f is ____

(1) one-one (2) onto

(3) bijective (4) f is not defined

60. The solution set of the inequation $\frac{x^2 + 6x - 7}{|x + 4|} < 0$ is ____

(1) (–7, 1) (2) (–7, – 4)

(3) (–7, – 4) ∪ (– 4, 1) (4) (–7, – 4) ∪ (4, 1)

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