50114

ROLL No. | | | | | |

TEST BOOKLET No. **1432**

APTITUDE TEST FOR M.C.A.

Time: 2 Hours | Maximum Marks: 450

INSTRUCTIONS TO CANDIDATES

1. You are provided with a Test Booklet and an Optical Mark Reader (OMR) Answer Sheet to mark your responses. Do not soil the Answer Sheet. Read carefully all the instructions given on the Answer Sheet.
2. Write your Roll Number in the space provided on the top of **this page**.
3. Also write your Roll Number, Test Code, and Test Subject in the columns provided for the same on the **Answer Sheet**. Darken the appropriate bubbles with a **Ball Point Pen.**
4. The paper consists of 150 objective type questions. All questions carry equal marks.
5. Each question has four alternative responses marked **A, B, C** and **D** and you have to **darken** the bubble fully by a **Ball Point Pen** corresponding to the correct response as indicated in the example shown on the Answer Sheet.
6. Each correct answer carries **3** marks and each wrong answer carries **1** minus mark.
7. Space for rough work is provided at the end of this Test Booklet.
8. You should return the Answer Sheet to the Invigilator before you leave the examination hall. However, you can retain the Test Booklet.
9. Every precaution has been taken to avoid errors in the Test Booklet. In the event of any such unforeseen happenings, the same may be brought to the notice of the Observer/Chief Superintendent in writing. Suitable remedial measures will be taken at the time of evaluation, if necessary.

SEAL

50114

APTITUDE TEST FOR M.C.A.

1. The straight line $3x + 2y + 6 = 0$

   (A) is a tangent to the circle $x^2 + y^2 - 2x - 2y + 1 = 0$

   (B) lies outside the circle $x^2 + y^2 - 2x - 2y + 1 = 0$

   (C) intersects the circle $x^2 + y^2 - 2x - 2y + 1 = 0$

   (D) None of the above

2. The eccentricity of the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is

   (A) $\frac{1}{3}$ (B) $-\frac{1}{3}$

   (C) 3 (D) –3

3. Asymptotes of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are

   (A) $x = \pm \frac{b}{a} y$ (B) $y = \pm \frac{b}{a} x$

   (C) $x + y = 0$ (D) $(x - y) = 0$

4. The distance between the parallel lines represented by $16x^2 + 24xy + 9y^2 + 40x + 30y - 75 = 0$ is

   (A) 1 (B) 2

   (C) 3 (D) 4

5. The unit vector normal to the surface $x^2 + 2y^2 + z^2 = 7$ at $(1, -1, 2)$ is

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

(B) $\frac{i-2j+2k}{3}$

(C) $i + 2j + k$

(D) $\frac{i+2j+k}{2}$

6. Evaluate $\frac{-4^2.(6.2)^0}{3^{-2}}$

(A) -144

(B) 144

(C) $\frac{-16}{9}$

(D) $\frac{16}{9}$

7. What is the multiplicative inverse of $\frac{3}{4}+\frac{3}{4}i$?

(A) $\frac{3+3i}{4}$

(B) $\frac{4}{3+3i}$

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

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

8. If $m > 0$, the expression $\left(\sqrt{m}\right)\left(\sqrt{2m}\right)$ is equivalent to

(A) $\sqrt{2m}$

(B) $m^2\sqrt{2}$

(C) $m\sqrt{2}$

(D) $2m$

9. The divergence and curl of a vector are

(A) vector and a scalar

(B) scalar and a vector

(C) both scalars

(D) both vectors

10. If $\bar{r} = xi + yj + zk$, then $\nabla \cdot \bar{r}$ and $\nabla^2 \left(\frac{1}{r}\right)$ (where $r = \sqrt{x^2 + y^2 + z^2}$) are

(A) both zero
(B) both 3
(C) 3 and 0
(D) 0 and 3

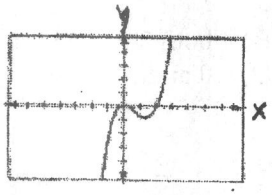
11. Div $(\overline{A} \times \overline{B})$ is equal to

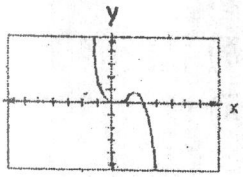
(A) $\overline{A} \times div\, \overline{B} + div\, \overline{A} \times \overline{B}$
(B) $\overline{B} \cdot (curl\, \overline{A}) - \overline{A} \cdot (curl\, \overline{B})$
(C) $\overline{A} \cdot (curl\, \overline{B}) + \overline{B} \cdot (curl\, \overline{A})$
(D) None of the above

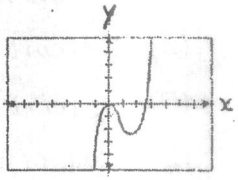
12. The 7^{th} term of the geometric sequence $\frac{3}{64}, \frac{-3}{16}, \frac{3}{4}, -3 \ldots$. is

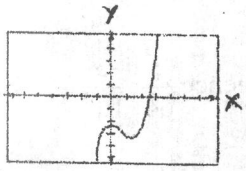
(A) -48
(B) 192
(C) 3072
(D) -12288

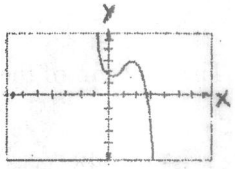
13. The graph shown below represents the equation $y = f(x)$. which of the choices represents $g(x)$, if $g(x) = -f(x)$?



(A) 

(B) 

(C) 

(D) 

14. What is the value of $2\sum_{n=0}^{2}\left(n^2 + 2^n\right)$?

(A) 12
(B) 22
(C) 24
(D) 26

15. $\int_{|z|=1} \frac{dz}{z^2 e^z}$ is equal to

(A) $-2\pi i$
(B) $2\pi i$
(C) 0
(D) None of the above

16. The function $f(z) = \frac{\bar{z}}{z}$ is

(A) analytic at $z = 0$
(B) analytic for all $z \neq 0$
(C) nowhere analytic
(D) analytic for all z

17. The sequence $1, 1-\frac{1}{2}, 1+\frac{1}{3}, 1-\frac{1}{4}, \ldots$ is

(A) bounded but not convergent
(B) convergent but not bounded
(C) convergent
(D) None of the above

18. The coefficient of x^{3n+1} in the expansion of $\frac{1}{1+x+x^2}$ is

(A) 0 (B) -1
(C) 1 (D) 3

19. If a, b, c are the sides of a triangle, then

(A) $a + b > c$ alone holds
(B) $b + c > a$ alone holds
(C) $c + a > b$ alone holds
(D) All of the above should hold

20. If every side of a triangle is doubled, then the area of the new triangle is k times that of the old triangle. Then the value of k is

(A) 2 (B) $\sqrt{3}$
(C) $\sqrt{2}$ (D) 4

21. In a triangle ABC, $a = 25$, $c = 50$ and $A = 30°$. Then

(A) $B = 90°, C = 60°$ (B) $C = 90°, B = 60°$
(C) $C = 100°, B = 50°$ (D) the triangle is isosceles

22. What is the solution set of the equation $\frac{x}{x-4} - \frac{1}{x+3} = \frac{28}{x^2-x-12}$?

(A) $\{6\}$ (B) $\{4,6\}$
(C) $\{-6\}$ (D) $\{4\}$

23. In the equation $x^2 - 7x + 2 = 0$, the sum of the roots exceeds the product of the roots by

(A) 9
(B) 5
(C) −9
(D) −5

24. The roots of the equation $3x^2 - 4x + 2 = 0$ are

(A) $\frac{1 \pm \sqrt{2}}{3}$
(B) $\frac{2 \pm \sqrt{10}}{3}$
(C) $\frac{2 \pm i\sqrt{2}}{3}$
(D) $4 \pm \frac{i\sqrt{2}}{3}$

25. The roots of the equation $2x^2 + 3x + 2 = 0$ are

(A) real, rational, and equal
(B) real, rational, and unequal
(C) real, irrational, and unequal
(D) imaginary

26. What is the value of b in the equation $4^{2b-3} = 8^{1-b}$?

(A) 3/7
(B) 7/9
(C) 9/7
(D) 10/7

27. The volume of a soap bubble is represented by the equation $V = 0.094\sqrt{A^3}$, where A represents the surface of the bubble. Which of the following expressions is equivalent to V?

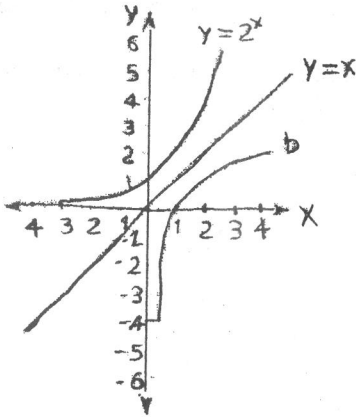
(A) $0.094A^{\frac{3}{2}}$
(B) $0.094A^{\frac{2}{3}}$
(C) $0.094A^6$
(D) $(0.094A^3)^{\frac{1}{2}}$

28. What is the solution set of the inequality $x^2+3x-10>8$?

(A) $\{x|-6<x<3\}$ (B) $\{x|x<-6 \text{ or } x>3\}$

(C) $\{x|-3<x<6\}$ (D) $\{x|x<-3 \text{ or } x>6\}$

29. In the diagram, figure b is the reflection of $y=2^x$ in the line $y=x$. Which is an expression for the equation of figure b?



(A) $y=(-2)^x$ (B) $y=2^{-x}$

(C) $y=\log_2 x$ (D) $y=\log_x 2$

30. The function defined by $f(x)=\sin x+\cos 2x$ is

(A) unbounded (B) bounded

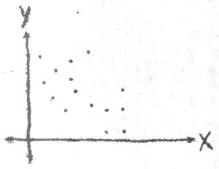
(C) discontinuous at $x=0$ (D) None of the above

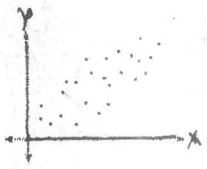
31. The data, shown below, was collected regarding the class size of the Advanced Placement course offered at a local high school. Which statement about the range of this sample is true?

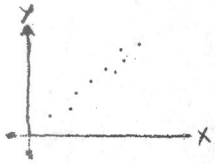
Class Size	Frequency
14	2
10	3
8	1

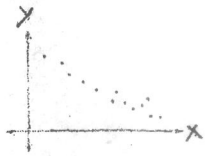
(A) Range < standard deviation
(B) Range = mean
(C) Range > mean
(D) Range < mean

32. Which graph represents data used in a linear regression that produces a correlation coefficient closest to −1?

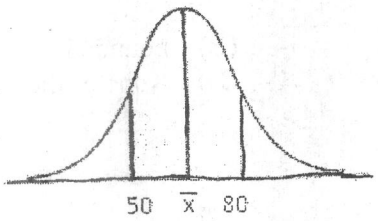
(A) 

(B) 

(C) 

(D) 

33. In the following diagram, about 68% of the scores fall within the shaded area, which is symmetric about the mean $\bar{x}$. The distribution is normal and the scores in the shaded area range from 50 to 80. What is the standard deviation of the scores in this distribution?



(A) 7.5
(B) 15
(C) 30
(D) 65

34. A basketball squad has ten players. Which expression represents the number of five-player teams that can be made if Tucker, the team captain, must be on every team?

(A) ${}_{10}C_5$
(B) ${}_9C_4$
(C) ${}_9P_4$
(D) ${}_{10}P_5$

35. A committee of five members is to be randomly selected from a group of nine freshman and seven sophomores. Which expression represents the number of different committees of three freshman and two sophomores that can be chosen?

(A) ${}_9P_3 \cdot {}_7P_2$
(B) ${}_9C_3 + {}_7C_2$
(C) ${}_{16}C_3 \cdot {}_{16}C_2$
(D) ${}_9C_3 \cdot {}_7C_2$

36. If three fair coins are tossed, what is the probability of getting *at least* two heads?

(A) 2/3
(B) 1/2
(C) 3/8
(D) 1/8

37. A pair of dice is rolled. What is the probability of the sum being 10 or less?

(A) 3/36
(B) 33/36
(C) 10/36
(D) 6/36

38. The fourth term in the recursive sequence $a_1 = 3,\ a_n = a_{n-1} - n$ is

(A) 0
(B) −2
(C) −4
(D) −6

39. Which function is *not* one-to-one?

(A) $\{(0,1),(1,2),(2,3),(3,4)\}$
(B) $\{(0,0),(1,1),(2,2),(3,3)\}$
(C) $\{(0,1),(1,0),(2,3),(3,2)\}$
(D) $\{(0,1),(1,0),(2,0),(3,2)\}$

40. Determine $\lim_{x\to\infty}\left(\frac{-2x^3+x}{-4x^5+2x^2+2}\right)$

(A) ∞ (B) 0

(C) $\frac{1}{2}$ (D) $\frac{3}{10}$

41. If $x = a\,(t - \sin t), y = a\,(1 - \cos t)$, then $\frac{dy}{dx}$ at $t = \frac{\pi}{2}$ is

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$

(C) 1 (D) ∞

42. The matrix $A = \begin{bmatrix} 2 & 3 \\ 8 & a \end{bmatrix}$ is invertible if

(A) $a = 12$ (B) $a \neq 12$

(C) for any positive value of a (D) for any value of a

43. The rank of $\begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 4 & 4 & 4 \end{bmatrix}$ is

(A) 0 (B) 1

(C) 2 (D) 3

44. If $x + 2y + 3z = 2$ and $2x + 4y + 6z = a$ are infeasible, then

(A) $a \neq 4$ (B) $a = 4$

(C) $a = 0$ (D) $a \neq 0$

45. The negation of "If a TV is bad, then it is cheap" is

(A) if a TV is cheap, then it is bad

(B) a TV is bad but is not cheap

(C) if TV is good, then it is not cheap

(D) either a TV is bad or it is cheap

46. The solution of $|2x-3|<5$ is

(A) $(-\infty,-1)\cup(4,\infty)$ (B) $(-1,4)$

(C) $(-1,\infty)$ (D) $(-\infty,4)$

47. $S-(S-T)$ is equal to

(A) T (B) $S\cap T$

(C) S (D) $S\cup T$

48. The number of non-negative integral solutions of the equation $a+b+c=3$ is

(A) 6 (B) 8

(C) 10 (D) 12

49. The number of 3×3 binary matrices (A binary matrix is one whose entries are 0 or 1) is

(A) 2^9 (B) 2^6

(C) 2^3 (D) 9

50. $\int \sec x\, dx$ is equal to

(A) $\log\tan\left(\frac{\pi}{4}+\frac{x}{2}\right)$ (B) $\log\tan x$

(C) $\log\sec x$ (D) None of the above

51. $\int \log x\, dx$

(A) $x(\log x-1)$ (B) $x\log x$

(C) $\frac{1}{\log x}$ (D) $\frac{(\log x)^2}{2}$

52. $\int_0^1 \int_0^2 dx\, dy$ is equal to

(A) 1
(B) 2
(C) 4
(D) $\sqrt{2}$

53. $L^{-1}\left(\frac{1}{s+a}\right)$ is valid for

(A) $s > -a$
(B) $s > a$
(C) $s = a$
(D) $s = -a$

54. $L(\sin 2t)$ is

(A) $\frac{2}{s^2+4}$
(B) $\frac{s}{s^2+4}$
(C) $\frac{2}{s^2-4}$
(D) $\frac{s}{s^2-4}$

55. Determine $\frac{d}{dx}\left(\frac{4x^4-2x}{4x^4+2x}\right)$

(A) $\frac{24x^2-1}{(4x^3-2)^2}$
(B) $\frac{48x^2-1}{(4x^3+2)^2}$
(C) $\frac{12x^2}{(2x^3+1)^2}$
(D) $\frac{24x^2}{(4x^3+2)^2}$

56. Compute $\int_0^{\frac{1}{2}} \frac{4}{1+4t^2} dt$

(A) $-\pi$
(B) $\frac{3}{2}\pi$
(C) $\frac{1}{2}\pi$
(D) π

57. Give the equation of the normal line to the graph of $y = 2x\sqrt{x^2 + 8 + 2}$ at the point (0,2).

(A) $x - 4\sqrt{2}y = -8\sqrt{2}$
(B) $x + 4\sqrt{2}y = 8\sqrt{2}$
(C) $4\sqrt{2}x + y = 2$
(D) $-4\sqrt{2}x + y = 2$

58. $\int_{-\infty}^{\infty} e^{-\frac{x^2}{2}} dx$ is equal to

(A) 1
(B) 0
(C) $\frac{1}{2}$
(D) 2

59. $\lim_{n\to\infty}\left(1 - \frac{m}{n}\right)^n$ is equal to

(A) e^n
(B) e^{-n}
(C) e^m
(D) e^{-m}

60. If α and β are the roots of $x^2 + 4x + 8 = 0$, then $\frac{\alpha+\beta}{\alpha\beta}$ is

(A) $\frac{1}{2}$
(B) $-\frac{1}{2}$
(C) 2
(D) -2

61. What are the solution(s) to the system of equations $y = x^2 - 9$ and $y - 3 = x$?

(A) (−3,0) and (4,7)
(B) (−3,0)
(C) (4,7)
(D) No solutions

62. If α, β, γ are the roots of $x^3 + 7x + 2 = 0$, then the value of $(\alpha+\beta)(\beta+\gamma)(\gamma+\alpha)$ is

(A) 0 (B) -2
(C) 2 (D) None of the above

63. If $\overline{a}$ and $\overline{b}$ are two unit vectors and θ is the angle between them, then $\overline{a} + \overline{b}$ is a unit vector if

(A) $\theta = \frac{\pi}{3}$ (B) $\theta = \frac{\pi}{4}$

(C) $\theta = \frac{\pi}{2}$ (D) $\theta = 2\pi$

64. $\lim_{x\to 0} \frac{e^x - e^{-x}}{\log(1+x)}$ is equal to

(A) 0 (B) 1
(C) 2 (D) 3

65. The equation $x^3 + 14x^2 + 11x + 7 = 0$ can have

(A) at most 2 complex roots (B) at least 2 complex roots
(C) at most 2 real roots (D) at least 2 real roots

66. The coefficient of x^n in the expansion of $(1-x)^{-3}$ is

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

(C) $\frac{(n+1)(n+2)}{2}$ (D) $(n+1)(n+2)$

67. The complementary function of $(x^2D^2 + 3xD + 1)y = \frac{1}{(1+x)^2}$ is

(A) $A + B\log x$ (B) $\frac{A+B\log x}{x}$

(C) $Ae^{2x} + Be^{x}$ (D) None of the above

68. The value of x for which $4x^2 + 6x + 4$ is minimum is

(A) 0 (B) $-\frac{4}{3}$

(C) $-\frac{3}{4}$ (D) None of the above

69. The residue of $(z-1)^{-1}e^{z}$ at $z=1$ is

(A) 1 (B) e

(C) e^{-1} (D) 0

70. $\frac{1}{(1+2x)(1-3x)}$ can be expanded in ascending powers of x when

(A) $|x|<2$ (B) $|x|<3$

(C) $|x|<\frac{1}{2}$ (D) $|x|<\frac{1}{3}$

71. Let $f(x)=x^3$. A region is bounded between the graphs of $y=-1$ and $y=f(x)$ for x between -1 and 0, and between the graphs of $y=1$ and $y=f(x)$ for x between 0 and 1. Give an integral that corresponds to the area of this region.

(A) $\int_{-1}^{1}(1-x^3)dx$ (B) $\int_{0}^{1}2(1-x^3)dx$

(C) $\int_{0}^{1}2(1+x^3)dx$ (D) $\int_{-1}^{1}(1+x^3)dx$

72. Compute the derivative of $-4\sec(x)+2\csc(x)$

(A) $-4\sec(x)\tan(x)-2\csc(x)\cot(x)$

(B) $-4\csc(x)-2\sec(x)$

(C) $-4(\sec(x))^2-2(\csc(x))^2$

(D) $-4\sec(x)\tan(x)+2\csc(x)\cot(x)$

73. The average score for a Biology test is 77 and the standard deviation is 8. Which percent best represents the probability that any one student scored between 61 and 93 on the test?

(A) 99.5% (B) 95%

(C) 68% (D) 34%

74. The flight paths of two Thunderbird jets are plotted on a Cartesian coordinate plane, and the equations of the jets' flight paths are represented by $y=2^x+3$ and $y=0.5^x$. The best approximation of the intersection of the flight paths is

(A) $(-1.50, 2.82)$ (B) $(0,1)$

(C) $(-1.72, 3.3)$ (D) $(-2,-1)$