A

Test Booklet Code **A**

ME-2009

Test Booklet No. **506945**

This booklet contains 16 pages.
DO NOT open this Test Booklet until you are asked to do so.

Important Instructions :-

1. The MATHEMATICS test consists of **40** questions. Each question carries **1** mark. For each correct response the candidate will get **1** mark. For each incorrect response, ¼ mark will be deducted. The maximum mark is **40**.
2. The Test is of **1 hour** duration.
3. Use **Black Ball Point Pen only** for writing particulars on OMR Answer Sheet marking ● responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must handover the Answer Sheet to the Invigilator in the Room / Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **A**. Make sure that the CODE printed on the Answer Sheet is the same as that on this booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet.
8. Do not write your Seat No. anywhere else, except in the specified space in the Test Booklet / Answer Sheet.
9. Use of White fluid for correction is not permissible on the Answer Sheet.
10. Each candidate must show on demand his / her Admission Card to the Invigilator.
11. No candidate, without special permission of the Superintendent or Invigilator, should leave his / her seat.
12. Use of Manual Calculator is permissible.
13. The candidate should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and must sign the Attendance Sheet (Patrak - 01). Cases where a candidate has **not** signed the Attendance Sheet (Patrak-01) be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.
14. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
15. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
16. The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet. (Patrak-01)

Candidate's Name .....

Exam. Seat No.(in figures) ..... (in words) .....

Name of Exam. Centre .....Exam. Centre No. : .....

Test Booklet Code : ..... Test Booklet No. : .....

Candidate's Sign ..... *Block Supt. Sign* .....

MATHEMATICS

1. Find the incentre of the triangle, whose vertices are (3, 0), (0, 4) and (0, 0).

(A) $\left(\frac{1}{3}, \frac{1}{3}\right)$ (B) (3, 3)

(C) (1, 1) (D) (−1, −1)

2. A(k, 2) and B(3, 5) are points. The point (t, t) divide $\overline{AB}$ from A's side in the ratio of k ; then k = ... ; $k \in R - \{0, -1\}$.

(A) −2 (B) 2

(C) −4 (D) 4

3. If the lines $kx - 2y - 1 = 0$ and $6x - 4y - m = 0$ are identical (co-incident) lines, then the values of k and m are .....

(A) $k = -3, m = 2$ (B) $k = 3, m = -2$

(C) $k = 3, m = 2$ (D) $k = -3, m = -2$

4. The measure of the angle between pair of lines $x = y$ and $y = 0$ is .....

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

(Space for Rough Work)

5. The slope of a line $\{(x, y) / x = 2t + 3,\ y = 2t + 5,\ t \in R\}$ is .....

(A) $-1/2$

(B) 2

(C) -1

(D) 1

6. If $53x - 54y + 17 = 0$ and $106x - 108y = -4$ are the tangents of the circle, then radius of the circle is = ...

(A) $\frac{3}{2\sqrt{229}}$

(B) $\frac{30}{\sqrt{5725}}$

(C) $\frac{3}{2\sqrt{5725}}$

(D) $\frac{3}{\sqrt{229}}$

7. If the circles $x^2 + y^2 + 4x + 8y = 0$ and $x^2 + y^2 + 8x + 2ky = 0$ touch each other, then k = ...

(A) 8

(B) 4

(C) 12

(D) -8

8. Equation of the directrix of Parabola $2x^2 = 14y$ is .....

(A) $x = -\frac{7}{4}$

(B) $x = \frac{7}{4}$

(C) $y = -\frac{7}{4}$

(D) $y = \frac{7}{4}$

(Space for Rough Work)

9. If $2y = x + k$ is tangent to the Parabola $y^2 = 24x$, then $k =$ .....

(A) -24

(B) -12

(C) 12

(D) 24

10. Obtain the equation of the Ellipse, whose vertices are $(\pm 5, 0)$ and foci are $(\pm 4, 0)$.

(A) $\frac{x^2}{16} + \frac{y^2}{25} = 1$

(B) $\frac{x^2}{25} + \frac{y^2}{16} = 1$

(C) $\frac{x^2}{9} + \frac{y^2}{25} = 1$

(D) $\frac{x^2}{25} + \frac{y^2}{9} = 1$

11. Asymptotes of a Hyperbola $\frac{x^2}{25} - \frac{y^2}{16} = 1$ are .....

(A) $x = \pm\frac{4}{5}y$

(B) $y = \pm\frac{4}{5}x$

(C) $x = \pm\frac{25}{16}y$

(D) $y = \pm\frac{5}{4}x$

(Space for Rough Work)

12. The value of e for rectangular Hyperbola is .....

(A) $-\sqrt{2}$

(B) $\sqrt{2}$

(C) $-\frac{1}{\sqrt{2}}$

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

13. $(\bar{x}-\bar{y})\times(\bar{x}+\bar{y})=$ ....., where $\bar{x},\ \bar{y} \in R^3$

(A) $|\bar{x}|^2-|\bar{y}|^2$

(B) $\frac{1}{2}(\bar{x}\times\bar{y})$

(C) $2(\bar{x}\times\bar{y})$

(D) None of them

14. If $\bar{x}$ and $\bar{y}$ are unit vectors and $\bar{x}\cdot\bar{y}=0$, then .....

(A) $|\bar{x}+\bar{y}|=\sqrt{3}$

(B) $|\bar{x}+\bar{y}|=\sqrt{2}$

(C) $|\bar{x}+\bar{y}|=1$

(D) $|\bar{x}+\bar{y}|=2$

15. If the angle between $\bar{a}$ and $\bar{b}$ $(\bar{a},\bar{b}\neq\bar{0})$ is $\frac{5\pi}{6}$ and magnitude of projection of $\bar{a}$ on $\bar{b}$ is $6/\sqrt{3}$, then $|\bar{a}|$ = ...

(A) 6

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

(C) 12

(D) 4

(Space for Rough Work)

16. Find the area of ΔABC by using vectors,
where A(1, 1, 2), B(2, 3, 5), C(1, 3, 4).

(A) $\sqrt{3}$ (B) $\sqrt{3}/2$

(C) 4 (D) None of them

17. Find the direction ratio of the line $\frac{3-x}{1} = \frac{y-2}{5} = \frac{2z-3}{1}$.

(A) $-1 : 5 : 1$ (B) $1 : 5 : 1$

(C) $1 : 5 : 1/2$ (D) $-1 : 5 : 1/2$

18. Find the intersection point of $\frac{x}{1} = \frac{y}{2} = \frac{z}{2}$ and $2x + y + z = 6$.

(A) (1, 2, 2) (B) (2, 1, 1)

(C) (0, 0, 0) (D) None of these

19. Find the equation of the perpendicular drawn from the origin to the plane $2x + 4y - 5z = 10$.

(A) $\bar{r} = (2k,\ 4k, -5k),\ k \in R$

(B) $\bar{r} = (3k,\ 4k,\ 5k),\ k \in R$

(C) $\bar{r} = (2k,\ 5k,\ 4k),\ k \in R$

(D) None of these

(Space for Rough Work)

20. If one end point of a diameter of Sphere $x^2 + y^2 + z^2 - 6x - 12y - 2z + 20 = 0$ is (2, 3, 5), then find another end point of its diameter.

(A) (4, 3, 5) (B) (4, 3, – 3)

(C) (4, 9, – 3) (D) None of these

21. $\lim_{n \to \infty} r^n = 0$, then $r =$ .....

(A) $\frac{5}{4}$ (B) 1

(C) $\frac{4}{5}$ (D) 2

22. $\lim_{n \to \infty} \frac{1^2 + 2^2 + 3^2 + \ldots\ldots + n^2}{n^3} =$ .....

(A) $\frac{2}{3}$ (B) $\frac{1}{6}$

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

(Space for Rough Work)

23. $\lim_{x \to 1} \cos^{-1}\left(\frac{1-\sqrt{x}}{1-x}\right) =$ .....

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

24. $\lim_{x \to -3} \frac{3x^2 + ax + a - 7}{x^2 + 2x - 3}$ exists, then $a =$ .....

(A) 15 (B) –10

(C) 10 (D) –15

25. $\frac{d}{dx}\left[\cos x^\circ\right] =$ .....

(A) $-\sin x^\circ$ (B) $-\frac{\pi x}{180}\sin x$

(C) $-\frac{\pi}{180}\sin x^\circ$ (D) $\frac{\pi}{180}\sin x^\circ$

(Space for Rough Work)

26. $\frac{d}{dx}\left[x^x + x^a + a^x + a^a\right] =$ .....; a is constant.

(A) $x^x(1+\log x)+a\cdot x^{a-1}+a^x\log a$

(B) $x^x(1+\log x)+a^a(1+\log a)+a\,x^{a-1}+a^a(1+\log a)$

(C) $x^x(1+\log x)+a\cdot x^{a-1}$

(D) $x^x(1+\log x)+a^a(1+\log a)$

27. $f(x)=|x-3|$ is ..... at $x=3$.

(A) continuous and differentiable.

(B) discontinuous and differentiable.

(C) continuous and not differentiable

(D) discontinuous and not differentiable

28. $\frac{d}{dx}\left[\log_e e^{\sin(x^2)}\right] =$ .....

(A) $2\cos x$ (B) $2x\cos(x^2)$

(C) $2\cos(x^2)$ (D) $2x\,.\cos x$

(Space for Rough Work)

29. If there is 2% error in measuring the radius of Sphere, then ..... will be the percentage error in the surface area.

(A) 1% (B) 2%

(C) 3% (D) 4%

30. The distance from the (0, 0) of a normal to the curve $y = e^{2x} + x^2$ at $x = 0$ is .....

(A) $\frac{1}{\sqrt{5}}$ (B) $\frac{2}{\sqrt{5}}$

(C) $\frac{3}{\sqrt{5}}$ (D) $\frac{4}{\sqrt{5}}$

31. $f(x) = x^3 - 6x^2 - 36x + 2$ is decreasing function; then $x \in$ .....

(A) $(-\infty, -2)$ (B) $(-2, 6)$

(C) $(6, \infty)$ (D) None of them

(Space for Rough Work)

32. $\int \tan^{-1} x \, dx = \ldots\ldots + c$

(A) $x \tan^{-1} x + \frac{1}{2} \log \left|1 + x^2\right|$ (B) $x \tan^{-1} x - \frac{1}{2} \log \left|1 + x^2\right|$

(C) $\frac{1}{1 + x^2}$ (D) $x \tan^{-1} x + \frac{1}{2} \frac{\tan^{-1} x}{1 + x^2}$

33. $\int \frac{f'(x)}{\sqrt{f(x)}} dx = \ldots\ldots + c \quad ; \quad f(x) \neq 0$

(A) $2\sqrt{f(x)}$ (B) $2 f(x)$

(C) $\frac{1}{2}\sqrt{f(x)}$ (D) $\frac{1}{2} f(x)$

34. $\int \left[e^{a \log x} + e^{x \log a}\right] dx = \ldots\ldots + c ; \quad a, x > 1$

(A) $\frac{e^{a \log x}}{a \log x} + \frac{e^{x \log a}}{x \log a}$ (B) $\frac{e^{a \log x}}{a/x} + \frac{e^{x \log a}}{x}$

(C) $\frac{x^{a+1}}{a+1} + \frac{a^x}{\log a}$ (D) $\frac{x^{a-1}}{a-1} + a^x \cdot \log a$

(Space for Rough Work)

35. $\int \frac{\sqrt{\tan x}}{\sin x \cdot \cos x}\, dx = \ldots\ldots + c \;;\quad x \neq \frac{k\pi}{2}$ and $\tan x > 0$.

(A) $\sqrt{2\tan x}$ (B) $\sqrt{\tan x}$

(C) $\frac{1}{2\sqrt{\tan x}}$ (D) $2\sqrt{\tan x}$

36. $\int_{2}^{k} (2x+1)\, dx = 6$, then $k = \ldots\ldots$

(A) -2 (B) 3

(C) 4 (D) -3

37. $\int_{-1}^{1} \sin^3 x \cos^2 x \; dx = \ldots\ldots$

(A) 1 (B) 0

(C) -1 (D) None of these

(Space for Rough Work)

38. $\int_0^1 \frac{1}{x+\sqrt{x}}\,dx =$ .....

(A) log 1 (B) log 2

(C) log 3 (D) log 4

39. The degree of the equation $e^x + \sin\left(\frac{dy}{dx}\right) = 3$ is .....

(A) 0 (B) 1

(C) 2 (D) degree is not defined.

40. If the maximum horizontal range is 100 m, then the minimum initial velocity will be ..... for that.

(A) $14\sqrt{10}$ m/s (B) $14\sqrt{5}$ m/s

(C) $7\sqrt{10}$ m/s (D) $7\sqrt{5}$ m/s

(Space for Rough Work)