ME-2011

Test Booklet Code **A** **Test Booklet No.** **267425**

This booklet contains 12 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 Te 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 candidate 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 Supdt. Sign* .....

MATHEMATICS

1. The vertices of a triangle are A(0, 0), B(0, 2) and C(2, 0); then find the distance between its Ortho-centre and Circum-centre.

(A) 0 (B) $\sqrt{2}$

(C) $\frac{1}{\sqrt{2}}$ (D) None of these

2. The vertices of ΔABC are A(2, 2), B(– 4, – 4) and C(5, – 8). Find the length of a median of a triangle, which is passing through the point C.

(A) $\sqrt{65}$ (B) $\sqrt{117}$

(C) $\sqrt{85}$ (D) $\sqrt{116}$

3. The equation of the lines with slope -2, and intersecting X-axis at a distance of 3 units from the origin is .....

(A) $2x + y \pm 6 = 0$ (B) $x + 2y \pm 6 = 0$

(C) $2x + y \pm 3 = 0$ (D) $x + 2y \pm 3 = 0$

4. If the distance of a line from the origin is $\sqrt{5}$ and having intercepts in the ratio of 1 : 2 on axes, then the equations of lines are .....

(A) $2x - y \pm 5 = 0$ (B) $2x + y \pm 5 = 0$

(C) $x - 2y \pm 5 = 0$ (D) $x + 2y \pm 5 = 0$

5. Ortho-centre of the triangle formed by the lines $x - y = 0$, $x + y = 0$, $x = 3$ is .....

(A) (0, 0) (B) (3, 0)

(C) (0, 3) (D) can't be found

(Space for Rough Work)

6. If the line $y = mx + c$ is passing through origin and away from the circle $4x^2 + 4y^2 - 80y + 360 = 0$, then .....

(A) $|m| > 3$ (B) $m > 3$

(C) $m < -3$ (D) $|m| < 3$

7. The centre of the circle $2x^2 + 2y^2 + \frac{3}{2}x + 9 = 0$ is .....

(A) $\left(\frac{3}{8}, 0\right)$ (B) $\left(-\frac{3}{8}, 0\right)$

(C) $\left(0, \frac{3}{8}\right)$ (D) $\left(0, -\frac{3}{8}\right)$

8. The equation of tangent of $y^2 = 12x$ and making an angle $\frac{\pi}{3}$ with X-axis is .....

(A) $\pm y - \sqrt{3}x + \sqrt{3} = 0$ (B) $\pm y + \sqrt{3}x + 3 = 0$

(C) $\pm y - \sqrt{3}x - \sqrt{3} = 0$ (D) $\pm y + \sqrt{3}x - 3 = 0$

9. A focal chord of the Parabola $y^2 = 4x$ makes an angle of measure θ with the positive direction of the X-axis. If the length of the focal chord is 8,

then θ = ... $\left(0 < \theta < \frac{\pi}{2}\right)$

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$

(C) $\frac{\pi}{4}$ (D) None of them

(Space for Rough Work)

10. If a line $x + 2y = k$ touches to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$, then find k.

(A) $k = \pm 2$ (B) $k = \pm 5$

(C) $k = 25$ (D) $k = -25$

11. Equation of auxiliary circle of $\frac{x^2}{16} - \frac{y^2}{25} = -1$ is .....

(A) $x^2 + y^2 = 16$ (B) $x^2 + y^2 = 25$

(C) $x^2 + y^2 = 9$ (D) $x^2 + y^2 = 41$

12. Find the measure of angle between the asymptotes of $x^2 - y^2 = 16$.

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

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

13. If $|\bar{x}| = 13$ and direction angles of $\bar{x}$ are $\cos^{-1}\frac{3}{13}$, $\cos^{-1}\frac{4}{13}$ and $\cos^{-1}\frac{12}{13}$, then find $\bar{x}$.

(A) $3\bar{i} + 4\bar{j} - 12\bar{k}$ (B) $3\bar{i} + 4\bar{j} + 12\bar{k}$

(C) $3\bar{i} - 4\bar{j} + 12\bar{k}$ (D) $3\bar{i} - 4\bar{j} - 12\bar{k}$

14. In R^2, find the unit vector orthogonal to unit vector $\bar{x} = (\cos\alpha, \sin\alpha)$.

(A) $\left(\cos \alpha/2, \sin \alpha/2\right)$ (B) $(-\cos\alpha, -\sin\alpha)$

(C) $(-\sin\alpha, \cos\alpha)$ (D) $(\cos\alpha, \sin\alpha)$

(Space for Rough Work)

15. If $\bar{a} = 3\bar{i} + 4\bar{j} + \bar{k}$ and $\bar{b} = \bar{i} + \bar{j} - \bar{k}$, then $\text{Comp}_{\bar{b}}\,\bar{a}$ = ...

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

(C) $-3\sqrt{2}$ (D) $-2\sqrt{3}$

16. By vector method, find the co-ordinates of a point which divides $\overline{AB}$ from A in the ratio $-3 : 2$; where A(1, 2, 3), B(5, 6, 7).

(A) (13, 14, 15) (B) (–13, –14, –15)

(C) (–13, 14, 15) (D) (–13, –14, 15)

17. Find the shortest distance between the lines $\frac{x-3}{2} = \frac{y+15}{-7} = \frac{z-9}{5}$ and

$\frac{x+1}{2} = \frac{y-1}{1} = \frac{z-9}{-3}$

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

(C) $4\sqrt{3}$ (D) None of these

18. Find the distance between the planes $\bar{r} \cdot \left(2\bar{i} - \bar{j} + 3\bar{k}\right) = 4$ and

$\bar{r} \cdot \left(6\bar{i} - 3\bar{j} + 9\bar{k}\right) + 13 = 0.$

(A) $\frac{5}{3\left(\sqrt{14}\right)}$ (B) $\frac{10}{3\left(\sqrt{14}\right)}$

(C) $\frac{25}{3\left(\sqrt{14}\right)}$ (D) None of these

(Space for Rough Work)

19. Find the direction of intersecting line of two planes

$2x + y + z = 1$ and $3x + 2y - z = 3$

(A) (3, 5, 1) (B) (3, 5, –1)

(C) (– 3, 5, 1) (D) None of these

20. The equation of a Sphere having centre (1, 2, 3) and radius 3 units is .....

(A) $x^2 + y^2 + z^2 - 2x - 4y - 6z = 0$

(B) $x^2 + y^2 + z^2 - 2x - 4y - 6z + 5 = 0$

(C) $x^2 + y^2 + z^2 - 2x - 4y - 6z - 5 = 0$

(D) None of these.

21. $\lim_{x \to \infty} \left(1 + \frac{4}{x-1}\right)^{x+3} =$ .....

(A) e^4 (B) e^2

(C) e^3 (D) e

22. $N(4, \delta) \cap N(6, \delta) \neq \phi$, then the value of δ is .....

(A) 1 (B) > 1

(C) < 1 (D) δ is not possible.

23. $\lim_{x \to 2} \frac{x^n - 2^n}{x-2} = 32$, then $n =$ ..... ; $n \in N$

(A) 3 (B) 4

(C) 5 (D) 2

(Space for Rough Work)

24. If $f(x)=\begin{cases} cx+1 & ; \quad x \le 3 \\ cx^2-1 & ; \quad x>3 \end{cases}$ is continuous at $x = 3$, then c = ...

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

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

25. If $f'(x) = f(x)$, $f(0) = 1$, then $\lim\limits_{x \to 0} \frac{f(x)-1}{x}$ = ...

(A) 0 (B) 1

(C) -1 (D) 2

26. $\frac{d}{dx}\left[x^3\left(\cos^{-1}x+\sin^{-1}x\right)\right]$ = ... ; $|x|<1$

(A) 0 (B) $\frac{\pi}{2}\cdot x^3$

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

27. $\frac{d}{dx}\left[\sin^{-1}\frac{x}{a}\right]$ = ... ; $a<0$ and $\left|\frac{x}{a}\right|<1$

(A) $\frac{1}{\sqrt{a^2-x^2}}$ (B) $\frac{1}{\sqrt{x^2-a^2}}$

(C) $\frac{-1}{\sqrt{a^2-x^2}}$ (D) $\frac{-1}{\sqrt{x^2-a^2}}$

(Space for Rough Work)

28. If $\pi < x < 2\pi$, then $\frac{d}{dx}\left[\tan^{-1}\left(\frac{1-\cos x}{1+\cos x}\right)^{1/2}\right]$ is .....

(A) 0 (B) 1

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

29. A tangent to the curve $y = \log_e x$ at point P is passing through the point (0, 0), then the co-ordinates of point P are .....

(A) $(0, e)$ (B) $(e, 0)$

(C) $(e, 1)$ (D) $(1, e)$

30. Find the point on the Parabola $y^2 = 8x$ such that $\frac{dx}{dt} = \frac{dy}{dt}$

(A) (0, 0) (B) $\left(\frac{1}{2}, 2\right)$

(C) (4, 2) (D) (2, 4)

31. The equation of the normal to the curve $x^2 = 4y$ passing through the point (1, 2) is .....

(A) $x + y - 3 = 0$ (B) $x - y - 3 = 0$

(C) $x + y + 3 = 0$ (D) $x - y + 3 = 0$

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

(A) $\log\left|e^x + x^e\right|$ (B) $e \log\left|e^x + x^e\right|$

(C) $\frac{1}{e}\log\left|e^x + x^e\right|$ (D) $\frac{1}{e}\log\left|e^{x-1} + x^{e-1}\right|$

(Space for Rough Work)

33. $\int \frac{x^3}{x-1}\,dx + \int \frac{1}{1-x}\,dx = \ldots\ldots + c$

(A) $\frac{x}{6}\left(2x^2 - 3x + 6\right)$

(B) $\frac{x}{6}\left(2x^2 + 3x + 6\right)$

(C) $\frac{x}{3}\left(2x^2 - 3x + 6\right)$

(D) $\frac{x}{3}\left(2x^2 + 3x + 6\right)$

34. $\int \frac{x^2}{\left(x^3-1\right)\left(x^3+4\right)}\,dx = \ldots\ldots + c$

(A) $\frac{1}{15}\log\left|\frac{x^3-1}{x^3+4}\right|$

(B) $-\log\left|\frac{x^3}{x^3-1}\right|$

(C) $\frac{1}{2}\log\left|\frac{\left(x^3-1\right)\left(x^3+4\right)}{x^3}\right|$

(D) $\log\left|\frac{x^3}{\left(x^3-1\right)\left(x^3+4\right)}\right|$

35. $\int e^{e^{e^x}} \cdot e^{e^x} \cdot e^x\,dx = \ldots\ldots + c$

(A) e^{e^x}

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

(C) $e^{e^{e^x}}$

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

(Space for Rough Work)

36. $\int_{-\pi/2}^{\pi/2} \frac{\sin^3 x.\cos^3 x}{\cos^2 x - \sin^2 x}\, dx =$ .....

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{4}$

(C) 0 (D) $-\pi$

37. $\int_{0}^{\pi/4} |\sin x - \cos x|\, dx =$ .....

(A) $\sqrt{2}+1$ (B) $\sqrt{2}-1$

(C) 0 (D) $2\sqrt{2}$

38. Find the area, if a curve $xy = 4$, bounded by the lines $x = 1$ and $x = 3$ and X-axis.

(A) log 12 (B) log 64

(C) log 81 (D) log 27

39. The integrating factor (I.F.) of the differential equation

$\cos x \frac{dy}{dx} = y \sin x + e^x \cos x$ is .....

(A) $e^{-\cos x}$ (B) $\cos x$

(C) $e^{\cos x}$ (D) $\sec x$

40. A body projected in vertical direction attains maximum height 50 m. Find its velocity at 25 m. height.

(A) $2\sqrt{10}$ m/s (B) $3\sqrt{10}$ m/s

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

(Space for Rough Work)

(Space for Rough work)