GuruAanklan Foundation / MHT-CET / Examination
Mathematics
Set - [A]

MATHEMATICS

General Instructions :

(i) The test is of **1½ hours** duration. This Question Paper is of total __ Pages

(ii) This paper consists of **50 questions.** The maximum marks are **100.**

(iii) There is **ONE** part in the question paper.
The distribution of marks is as under for each correct response.
Q. No.1 - 50 – MATHEMATICS (+2, 0) (100 marks) – 50 questions

(iv) Each question has 4 choices (**A), (B), (C) and (D)**, out of which **ONLY ONE** is correct. Candidates will be awarded **TWO** marks each for indicating **correct** response of each question & there is no negative marking.

MATHEMATICS
[Single Answer Choice Type]

This Section contains 50 Single choice questions. Each question has 4 choices (A), (B), (C) and (D) out of which ONLY ONE is correct.

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1. If P is a point on an ellipse $5x^2+4y^2=80$ whose foci are S and S'. Thus $PS+PS'=$ ____

(A) $4\sqrt{5}$ (B) 4 (C) 8 (D) 10

2. The value of $\int e^x\left[\frac{\sqrt{1-x^2}\sin^{-1}x+1}{\sqrt{1-x^2}}\right]dx$ is _____

(A) $e^x\sin^{-1}x+c$ (B) $-e^x\sin^{-1}x+c$ (C) $\frac{e^x}{\sqrt{1-x^2}}+c$ (D) $\frac{-e^x}{\sqrt{1-x^2}}+c$

3. If $\int xf(x)dx=\frac{1}{2}f(x)+c$ then $f(x)$ is _____

(A) e^x (B) e^{-x} (C) $\log x$ (D) e^{x^2}

4. The value of $\int \frac{\sin x}{\sin 3x}dx$ is ______

(A) $\frac{1}{\sqrt{3}}\log\left|\frac{\sqrt{3}-\tan x}{\sqrt{3}+\tan x}\right|+c$

(B) $\frac{1}{2\sqrt{3}}\log\left|\frac{\sqrt{3}-\tan x}{\sqrt{3}+\tan x}\right|+c$

(C) $\frac{1}{\sqrt{3}}\log\left|\frac{\sqrt{3}+\tan x}{\sqrt{3}-\tan x}\right|+c$

(D) $\frac{1}{2\sqrt{3}}\log\left|\frac{\sqrt{3}+\tan x}{\sqrt{3}-\tan x}\right|+c$

5. $\int_0^{2\pi} e^x\left(\frac{x}{2}+\frac{\pi}{4}\right)dx =$ _____

(A) $\sqrt{2}$

(B) $2\sqrt{2}$

(C) $e^{2\pi}\left(\frac{5\pi}{4}-\frac{1}{2}\right)+\frac{1}{2}-\frac{\pi}{4}$

(D) $e^{2\pi}\left(\frac{5\pi}{4}-\frac{1}{2}\right)+\frac{1}{2}+\frac{\pi}{4}$

6. The equation of line passing through the point (–5, 4) and making the intercept of length $\frac{2}{\sqrt{5}}$ between the lines $x+2y-1=0$ and $x+2y+1=0$ is.....

(A) $2x-y+4=0$ (B) $2x-y-14=0$ (C) $2x-y+14=0$ (D) None of these

7. If $f(a+b-x)=f(x)$ then $\int_a^b x f(x)dx =$ _____

(A) $\frac{a+b}{2}\int_a^b f(b-x)dx$ (B) $\frac{a+b}{2}\int_a^b f(x)dx$ (C) $\frac{b-a}{2}\int_a^b f(x)dx$ (D) $\frac{b-a}{2}\int_a^b f(b-x)dx$

8. Area of the region bounded by the parabola $y=x^2$ and the line $y = 4x$ is _______

(A) $\frac{32}{3}$sq.units (B) $\frac{16}{3}$sq.units (C) $\frac{8}{3}$sq.units (D) $\frac{4}{3}$sq.units

9. Particular solution for the differential equation, $\cos\left(\frac{dy}{dx}\right)=a\ \alpha, \alpha\in R, y(0)=2$ is_____

(A) $\sin\left(\frac{y+2}{x}\right)=a$ (B) $\sin\left(\frac{y-2}{x}\right)=a$ (C) $\cos\left(\frac{y+2}{x}\right)=a$ (D) $\cos\left(\frac{y-2}{x}\right)=a$

10. The solution of the differential equation $\frac{dy}{dx}=(4x+y+1)^2$ is ______

(A) $(4x+y+1)=2\tan(2x+k)$

(B) $(4x+y+1)^3=3\tan(2x+k)$

(C) $(4x+y+1)^2=2\tan(2x+k)$

(D) $(4x+y+1)=3\tan(2x+k)$

11. If for the triangle perimeter is 37 cms and length of sides are in G.P. also the length of the smallest side is 9 cms, then length of remaining two sides are ____ and ____

(A) 12, 16 (B) 14, 14 (C) 10, 18 (D) 15, 13

12. The bacteria culture grows at a rate proportional to its size. After 2 hours there are 600 bacteria and after 8 hours the count is 75000, then its initial population is _________

(A) 102 (B) 120 (C) 124 (D) 142

13. A random variable X has the following probability distribution

$X=x$	-2	-1	0	1	2	3
$P[X=x]$	0.1	k	0.2	2k	0.3	k

then the expected value is _____

(A) 0.6 (B) 0.5 (C) 0.7 (D) 0.8

14. The probability distribution of X, the number of defects per 10 meter of a fabric as

$X=x$	0	1	2	3	4
$P[X=x]$	0.45	0.35	0.15	0.03	0.02

then variance (x) is _______

(A) 0.5326 (B) 0.82 (C) 1.54 (D) 0.8676

15. If X has binomial distribution with mean 'np' and variance 'npq' then $\frac{P[X=k]}{P[X=k-1]}$ is _____

(A) $\frac{n-k}{k-1}\cdot\frac{p}{q}$ (B) $\frac{n-k+1}{k}\cdot\frac{p}{q}$ (C) $\frac{n+1}{k}\cdot\frac{p}{q}$ (D) $\frac{n-1}{k+1}\cdot\frac{p}{q}$

16. A common tangent to $9x^2-16y^2=144$ and $x^2+y^2=9$ is

(A) $y=3\sqrt{\frac{2}{7}}x+\frac{15}{\sqrt{7}}$ (B) $y=2\sqrt{\frac{3}{7}}x+15\sqrt{7}$ (C) $y=\frac{3}{\sqrt{7}}x+\frac{15}{\sqrt{7}}$ (D) $y=2\sqrt{\frac{3}{7}}x+15\sqrt{7}$

17. The contrapositive of the statement pattern $(p\vee q)\to r$ is_____

(A) $r\to(p\vee q)$ (B) $\sim r\to(p\vee q)$ (C) $\sim r\to(\sim p\wedge\sim q)$ (D) $p\to(q\vee r)$

18. The disjunction $p v \sim q$ is false only when ______

(A) both p and q are false (B) p is true and q is false

(C) p is false and q is true (D) both p and q are true

19. The simple logical expression of $(\sim p\wedge q)\vee(\sim p\wedge\sim q)\vee(p\wedge\sim q)$ is _____

(A) $\sim p\vee q$ (B) $\sim p\vee\sim q$ (C) $p\vee\sim q$ (D) $p\wedge\sim q$

20. If a nilpotent matrix of order 2 then $A(1+A)^n$ is equal to

(A) A (B) 0 (C) A^2 (D) A^{-1}

21. If the line $x-1=0$ is the directrix of the parabola $y^2-kx+8=0$ then one of the value of k is

(A) 4 (B) $\frac{1}{8}$ (C) $\frac{1}{4}$ (D) 8

22. Let $A=\begin{bmatrix}1&0&0\\2&1&0\\3&2&1\end{bmatrix}$, if u_2 and u_3 are column matrices such that $Au_2=\begin{bmatrix}0\\1\\0\end{bmatrix}, Au_3=\begin{bmatrix}0\\0\\1\end{bmatrix}$ then,

$u_1+u_2=$ ____

(A) $\begin{bmatrix}0\\1\\-1\end{bmatrix}$ (B) $\begin{bmatrix}1\\-1\\1\end{bmatrix}$ (C) $\begin{bmatrix}0\\1\\1\end{bmatrix}$ (D) $\begin{bmatrix}1\\-1\\0\end{bmatrix}$

23. In ABC if $\cos A=\frac{\sin B}{2\sin C}$, then Δ is _____

(A) an isosceles (B) scalene (C) an equilateral (D) right angled

24. In ΔABC, $\frac{c-b\cos A}{b-c\cos A}=$ ______

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

25. $\tan\left[\tan^{-1}\left(\frac{1}{2}\right)-\tan^{-1}\left(\frac{1}{3}\right)\right]$ is _____

(A) $\frac{1}{3}$ (B) $\frac{1}{5}$ (C) $\frac{1}{7}$ (D) $\frac{1}{9}$

26. The number of integral value of m for which $x^2+y^2+(1-m)x+my+5=0$ is the equation of a circle whose radius cannot exceed 5, is

(A) 20 (B) 18 (C) 16 (D) 24

27. If f(x) is continuous at x = 0, where $f(x)=\frac{e^{x^2}-\cos x}{x^2}$, for $x\neq 0$, then $f(0)$ is _____

(A) 1 (B) $\frac{2}{3}$ (C) $\frac{3}{2}$ (D) $\frac{5}{2}$

28. If $x^K y^T=(x+y)^{K+T}$ then $\frac{dy}{dx}$ is _____

(A) $\frac{x}{y}$ (B) $-\frac{x}{y}$ (C) $\frac{y}{x}$ (D) $-\frac{y}{x}$

29. If $y=\sqrt{\log x+\sqrt{\log x+\sqrt{\log x+........\infty}}}$ then $\frac{dy}{dx}=$ ____

(A) xy (B) $\frac{1}{x(2y-1)}$ (C) –xy (D) $\frac{-1}{2xy}$

30. If $\cos^{-1}\left(\frac{x^2-y^2}{x^2+y^2}\right)=a$ then $\frac{d^2y}{dx^2}$ is _____

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

31. In a box containing 100 bulbs, 10 bulbs are defective. The probability that out of a sample of 5 bulbs, none is defective is

(A) 10^{-5} (B) 2^{-5} (C) $(0.9)^5$ (D) 0.9

32. The function $f(x)=2x^3-15x^2-144x-7$ is decreasing for _____

(A) $3<x<8$ (B) $3\le x\le 8$ (C) $-3<x<8$ (D) $-3\le x<8$

33. If displacement of particle is given by $x=160t-16t^2$, then at t = 1 and t = 9, velocities are _____

(A) equal (B) equal and opposite (C) zero (D) in the ratio 2 : 1

34. If the equation $3x^2+10xy+3y^2+16y+k=0$ represents a pair of lines, then k is ____

(A) 16 (B) –12 (C) –16 (D) 12

35. The combined equation of the lines passing through the origin and which are at a distance of 9 units from the y-axis, is ________

(A) $x^2-81=0$ (B) $x^2+81=0$ (C) $y^2-81=0$ (D) $y^2+81=0$

36. In a certain town 30% families own a scooter and 40% on a car 50% own neither a scooter nor a car 200 families ow both a scooter and car consider the following statements in this regard

(1) 20% families own both scooter and car

(2) 35% families own either a car or a scooter

(3) 10000 families live in town

Which of the above statements are correct?

(A) 2 and 3 (B) 1, 2 and 3 (C) 1 and 2 (D) 1 and 3

37. If the slope of one of the lines given by $kx^2+4xy-y^2=0$ exceeds the slope of the other by 8, then value of k is _______

(A) 8 (B) 16 (C) 4 (D) 12

38. The volume of tetrahedron whose vertices are P (–1, 2, 3), Q (3, –2, 1), R (2, 1, 3), S (–1, 2, 4) is ______

39. $\bar{p}=\frac{\bar{b}\times\bar{c}}{[\bar{a}\ \bar{b}\ \bar{c}]}, \bar{q}=\frac{\bar{c}\times\bar{a}}{[\bar{a}\ \bar{b}\ \bar{c}]}, \bar{r}=\frac{\bar{a}\times\bar{b}}{[\bar{a}\ \bar{b}\ \bar{c}]}$, $\bar{a}\ \bar{b}\ \bar{c}$ are non-coplanar vectors then $[\bar{a}+\bar{b}+\bar{c}]\cdot[\bar{p}+\bar{q}+\bar{r}]$ is

(A) 0 (B) 2 (C) 3 (D) –1

40. Let the vectors $\bar{a}$ and $\bar{b}$ represents adjacent sides AB and BC respectively of regular hexagon ABCDEF. Then the vector representing side CD is ______

(A) $\bar{b}-\bar{a}$ (B) $\bar{b}+\bar{a}$ (C) $\bar{a}-\bar{b}$ (D) $2\bar{a}+\bar{b}$

41. If $f(x)=\sin^2 x+\sin^2\left(x+\frac{x}{3}\right)+\left(\cos x\cos\left(x+\frac{\pi}{3}\right)\right)$ and $g\left(\frac{5}{4}\right)=1$ then gof(x) = ...

(A) 1 (B) 2 (C) -2 (D) -1

42. The line joining the points (–2, 1, –8) and (a, b, c) is parallel to the line whose direction ratio are 6, 2, 3 then ______

(A) a = 0, b = 5, c = 5 (B) a = 4, b = 3, c = –5 (C) a = 3, b = 5, c = 11 (D) a = 1, b = 2, c = –6

43. If a straight line in space is equally inclined to the co-ordinate axis, then the cosine of its angle of inclination to any one of the axes is _______

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

44. The shortest distance between the lines $\vec{r}=(4i-j)+\lambda(i+2j-3k)$ and $\vec{r}=(i-j+2k)+\lambda(i+4j-5k)$, is ______

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

45. If the points $(5,5,\lambda),(-1,3,2)$ and $(-4,2,-2)$ are collinear then $\lambda=$ ____

(A) –6 (B) 5 (C) 6 (D) 10

46. If θ is acute angle between the line $\frac{x+1}{1}=\frac{y-1}{2}=\frac{z-2}{2}$ and the plane $2x-y+\sqrt{\lambda}\,z+4=0$ such that $\theta=\cos^{-1}\left(\frac{\sqrt{8}}{3}\right)$ then $\lambda=$ _____

(A) $\frac{-4}{3}$ (B) $\frac{3}{4}$ (C) $\frac{-3}{5}$ (D) $\frac{5}{3}$

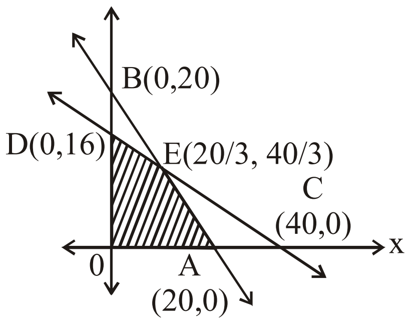
47. If the plane meets the co-ordinates axes at A, B, C such that the centroid of triangle ABC is $\left(\frac{1}{3},\frac{2}{3},\frac{4}{3}\right)$ then equation of plane is ______

(A) x + 2y + 4z = 4 (B) 4x + 2y + z = 4 (C) x + y + z = 4 (D) x + 2y + 3z = 8

48. The distance between the planes 2x – y + 2z + 3 = 0 and 4x – 2y + 4z + 5 = 0 is ______

(A) $\frac{2}{3}$ (B) $\frac{1}{3}$ (C) $\frac{1}{5}$ (D) $\frac{1}{6}$

49. The feasible region is represented by ______



(A) $2x+5y\geq 80,\ x+y\leq 20, x\geq 0, y\geq 0$ (B) $2x+5y\leq 80, x+y\geq 20, x\geq 0, y\geq 0$

(C) $2x+5y\leq 80, x+y\leq 20, x\geq 0, y\geq 0$ (D) $2x+5y\geq 80, x+y\geq 20, x\geq 0, y\geq 0$

50. If A is the set of even natural numbers less then 8 and b is the set of prime numbers less than 7, then the number of relations from A to B is

(A) 2^9 (B) 9^2 (C) 3^2 (D) 2^9-1