MHT CET 2016 Paper 1 Mathematics Memory Based Question Paper PDF

1. Let $X \sim B(n,p)$, if $E(X)=5, Var(X)=2.5$ then $P(X<1)=$

(A) $\left(\frac{1}{2}\right)^{11}$ (B) $\left(\frac{1}{2}\right)^{10}$ (C) $\left(\frac{1}{2}\right)^{6}$ (D) $\left(\frac{1}{2}\right)^{9}$

2. Derivative of $\tan^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)$ with respect to $\sin^{-1}(3x-4x^3)$ is

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

3. The differential equation of the family of circles touching y-axis at the origin is

(A) $(x^2+y^2)\frac{dy}{dx}-2xy=0$ (B) $x^2-y^2+2xy\frac{dy}{dx}=0$
(B) $(x^2-y^2)\frac{dy}{dx}-2xy=0$ (D) $(x^2+y^2)\frac{dy}{dx}+2xy=0$

4. If $A=\begin{bmatrix}1&1&0\\2&1&5\\1&2&1\end{bmatrix}$, then $a_{11}A_{21}+a_{12}A_{22}+a_{13}A_{23}=$

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

5. If Rolle's theorem for $f(x)=e^x(\sin x-\cos x)$ is verified on $[\pi/4, 5\pi/4]$ then the value of c is

(A) $\pi/3$ (B) $\pi/2$ (C) $3\pi/4$ (D) π

6. The joint equation of lines passing through the origin and trisecting the first quadrant is

(A) $x^2+\sqrt{3}xy-y^2=0$ (B) $x^2-\sqrt{3}xy-y^2=0$
(B) $\sqrt{3}x^2-4xy+\sqrt{3}y^2=0$ (D) $3x^2-y^2=0$

7. If $2\tan^{-1}(\cos x)=\tan^{-1}(2\csc x)$ then $\sin x+\cos x=$

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

8. Direction cosines of the line $\frac{x+2}{2}=\frac{2y-5}{3}, z=-1$ are

(A) $\frac{4}{5},\frac{3}{5},0$ (B) $\frac{3}{5},\frac{4}{5},\frac{1}{5}$ (C) $-\frac{3}{5},\frac{4}{5},0$ (D) $\frac{4}{5},\frac{2}{5},-\frac{1}{5}$

9. $\int\frac{1}{\sqrt{8+2x-x^2}}dx=$

(A) $\frac{1}{3}\sin^{-1}\left(\frac{x-1}{3}\right)+c$ (B) $\sin^{-1}\left(\frac{x+1}{3}\right)+c$
(B) $\frac{1}{3}\sin^{-1}\left(\frac{x+1}{3}\right)+c$ (D) $\sin^{-1}\left(\frac{x-1}{3}\right)+c$

10. The approximate value of $f(x) = x^3 + 5x^2 - 7x + 9$ at $x = 1.1$ is

(A) 8.6 (B) 8.5 (C) 8.4 (D) 8.3

11. If r.v. X : waiting time in minutes for bus and p.d.f. of X is given by $f(x) = \frac{1}{5}$ for $0 \leq x \leq 5$ and 0 otherwise, then probability of waiting time not more than 4 minutes is

(A) 0.3 (B) 0.8 (C) 0.2 (D) 0.5

12. In ΔABC, $(a-b)^2 \cos^2 \frac{c}{2} + (a+b)^2 \sin^2 \frac{c}{2} =$

(A) b^2 (B) c^2 (C) a^2 (D) $a^2 + b^2 + c^2$

13. Derivative of $\log(\sec\theta + \tan\theta)$ with respect to $\sec\theta$ at $\theta = \pi/4$ is

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

14. The joint equation of bisectors of angles between lines $x = 5$ and $y = 3$ is

(A) $(x-5)(y-3) = 0$ (B) $x^2 - y^2 - 10x + 6y + 16 = 0$
(B) $xy = 0$ (D) $xy - 5x - 3y + 15 = 0$

15. The point on the curve $6y = x^3 + 2$ at which y-coordinate is changing 8 times as fast as x-coordinate is

(A) $(4, 11)$ (B) $(4, -11)$ (C) $(-4, 11)$ (D) $(-4, -11)$

16. If the function $f(x) = x\sin(1/x)$ for $x \neq 0$ and $f(x) = k$ for $x = 0$ is continuous at $x = 0$, then $k =$

(A) 0 (B) 1 (C) -1 (D) $1/2$

17. If $y = e^{m\sin^{-1}x}$ and $(1-x^2)\left(\frac{dy}{dx}\right)^2 = Ay^2$, then $A =$

(A) m (B) $-m$ (C) m^2 (D) $-m^2$

18. $\int \left(\frac{4e^x - 25}{2e^x - 5}\right) dx = Ax + B\log|2e^x - 5| + c$ then

(A) $A = 5, B = 3$ (B) $A = 5, B = -3$ (C) $A = -5, B = 3$ (D) $A = -5, B = -3$

19. $\frac{\tan^{-1}(\sqrt{3}) - \sec^{-1}(-2)}{\csc^{-1}(-\sqrt{2}) + \cos^{-1}(-1/2)} =$

(A) $4/5$ (B) $-4/5$ (C) $3/5$ (D) 0

20. If $f(x) = \frac{\log(1+2x)\sin x^0}{x^2}$ for $x \neq 0$ and $f(x) = k$ for $x = 0$ is continuous at $x = 0$, then $k =$

(A) 2 (B) $1/2$ (C) $\pi/90$ (D) $90/\pi$

21. If $\log_{10}\left(\frac{x^2-y^2}{x^2+y^2}\right) = 2$, then $\frac{dy}{dx} =$

(A) $-\frac{99x}{101y}$ (B) $\frac{99x}{101y}$ (C) $-\frac{99y}{101x}$ (D) $\frac{99y}{101x}$

22. $\int_{-\pi/2}^{\pi/2} \log\left(\frac{2-\sin x}{2+\sin x}\right) dx =$

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

23. $\int \frac{(x^2+2)a^{(x+\tan^{-1}x)}}{x^2+1} dx =$

(A) $\log a \cdot a^{x+\tan^{-1}x} + c$ (B) $\frac{(x+\tan^{-1}x)}{\log a} + c$

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

24. The degree and order of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^3\right]^{7/3} = 7\left(\frac{d^2y}{dx^2}\right)$ respectively are

(A) 3 and 7 (B) 3 and 2 (C) 7 and 3 (D) 2 and 3

25. The acute angle between the line $\bar{r} = (\hat{i}+2\hat{j}+\hat{k}) + \lambda(\hat{i}+\hat{j}+\hat{k})$ and the plane $\bar{r}\cdot(2\hat{i}-\hat{j}+\hat{k}) = 5$ is

(A) $\cos^{-1}\left(\frac{\sqrt{2}}{3}\right)$ (B) $\sin^{-1}\left(\frac{\sqrt{2}}{3}\right)$ (C) $\tan^{-1}\left(\frac{\sqrt{2}}{3}\right)$ (D) $\sin^{-1}\left(\frac{\sqrt{2}}{\sqrt{3}}\right)$

26. The area of the region bounded by the curve $y = 2x - x^2$ and x-axis is

(A) $2/3$ sq. units (B) $4/3$ sq. units (C) $5/3$ sq. units (D) $8/3$ sq. units

27. If $\int \frac{f(x)}{\log(\sin x)} dx = \log[\log \sin x] + c$, then $f(x) =$

(A) $\cot x$ (B) $\tan x$ (C) $\sec x$ (D) $\csc x$

28. If A and B are foot of perpendicular drawn from point $Q(a,b,c)$ to the planes yz and zx, then equation of plane through the points A, B and O is

(A) $\frac{x}{a}+\frac{y}{b}-\frac{z}{c}=0$ (B) $\frac{x}{a}-\frac{y}{b}+\frac{z}{c}=0$

(B) $\frac{x}{a}-\frac{y}{b}-\frac{z}{c}=0$ (D) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=0$

29. If $\bar{a} = \hat{i}+\hat{j}-2\hat{k}$, $\bar{b} = 2\hat{i}-\hat{j}+\hat{k}$ and $\bar{c} = 3\hat{i}-\hat{k}$ and $\bar{c} = m\bar{a}+n\bar{b}$ then $m+n =$

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

30. $\int_0^{\pi/2} \left(\frac{\sqrt[n]{\sec x}}{\sqrt[n]{\sec x}+\sqrt[n]{\csc x}}\right) dx =$

(A) $\pi/2$ (B) $\pi/3$ (C) $\pi/4$ (D) $\pi/6$

31. If the p.d.f. of a r.v. X is given as $P(X = x_i) = \{0.2, 0.3, 0.15, 0.25, 0.1\}$ for $x_i = \{-2, -1, 0, 1, 2\}$, then $F(0) =$

(A) $P(X < 0)$ (B) $P(X > 0)$ (C) $1 - P(X > 0)$ (D) $1 - P(X < 0)$

32. The particular solution of the differential equation $y(1 + \log x)\frac{dx}{dy} - x\log x = 0$ when $x = e, y = e^2$ is

(A) $y = ex\log x$ (B) $ey = x\log x$ (C) $xy = e\log x$ (D) $y\log x = ex$

33. M and N are the midpoints of the diagonals AC and BD respectively of quadrilateral $ABCD$, then $\bar{AB} + \bar{AD} + \bar{CB} + \bar{CD} =$

(A) $2\bar{MN}$ (B) $2\bar{NM}$ (C) $4\bar{MN}$ (D) $4\bar{NM}$

34. If $\sin x$ is the integrating factor (I.F.) of the linear differential equation $\frac{dy}{dx} + Py = Q$, then P is

(A) $\log\sin x$ (B) $\cos x$ (C) $\tan x$ (D) $\cot x$

35. Which of the following equation does not represent a pair of lines?

(A) $x^2 - x = 0$ (B) $xy - x = 0$ (C) $y^2 - x + 1 = 0$ (D) $xy + x + y + 1 = 0$

36. Probability of guessing correctly at least 7 out of 10 answers in a "True" or "False" test is

(A) $11/64$ (B) $11/32$ (C) $11/16$ (D) $27/32$

37. Principal solutions of the equation $\sin 2x + \cos 2x = 0$, where $\pi < x < 2\pi$ are

(A) $7\pi/8, 11\pi/8$ (B) $9\pi/8, 13\pi/8$ (C) $11\pi/8, 15\pi/8$ (D) $15\pi/8, 19\pi/8$

38. If line joining points A and B having position vectors $6\bar{a} - 4\bar{b} + 4\bar{c}$ and $-4\bar{c}$ respectively, and the line joining points C and D having position vectors $-\bar{a} - 2\bar{b} - 3\bar{c}$ and $\bar{a} + 2\bar{b} - 5\bar{c}$ intersect, then their point of intersection is

(A) B (B) C (C) D (D) A

39. If $A = \begin{bmatrix} 2 & 2 \\ -3 & 2 \end{bmatrix}, B = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ then $(B^{-1}A^{-1})^{-1} =$

(A) $\begin{bmatrix} 2 & -2 \\ 2 & 3 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & 2 \\ -2 & 3 \end{bmatrix}$ (C) $\begin{bmatrix} 2 & -3 \\ 2 & 2 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$

40. If p : Every square is a rectangle, q : Every rhombus is a kite, then truth values of $p \to q$ and $p \leftrightarrow q$ are

(A) F, F (B) T, F (C) F, T (D) T, T

41. If $G(g)$, $H(h)$ and $P(p)$ are centroid, orthocenter and circumcenter of a triangle and $x\bar{p}+y\bar{h}+z\bar{g}=0$ then $(x,y,z)=$

(A) $1,1,-2$ (B) $2,1,-3$ (C) $1,3,-4$ (D) $2,3,-5$

42. Which of the following quantified statement is true?

(A) The square of every real number is positive

(B) There exists a real number whose square is negative

(C) There exists a real number whose square is not positive

(D) Every real number is rational

43. The general solution of the equation $\tan^2 x = 1$ is

(A) $n\pi+\pi/4$ (B) $n\pi-\pi/4$ (C) $n\pi\pm\pi/4$ (D) $2n\pi\pm\pi/4$

44. The shaded part of given figure (see diagram) indicates the feasible region, then the constraints are

(A) $x,y\geq 0, x+y\geq 0, x\geq 5, y\leq 3$

(B) $x,y\geq 0, x-y\geq 0, x\leq 5, y\leq 3$

(C) $x,y\geq 0, x-y\geq 0, x\leq 5, y\geq 3$

(D) $x,y\geq 0, x-y\leq 0, x\leq 5, y\leq 3$

45. Direction ratios of the line which is perpendicular to the lines with direction ratios $-1,2,2$ and $0,2,1$ are

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

46. If Matrix $A=\begin{bmatrix}1 & 2\\ 4 & 3\end{bmatrix}$ such that $Ax=I$, then $x=$

(A) $\frac{1}{5}\begin{bmatrix}1 & 3\\ 2 & -1\end{bmatrix}$ (B) $\frac{1}{5}\begin{bmatrix}4 & 2\\ 4 & -1\end{bmatrix}$ (C) $\frac{1}{5}\begin{bmatrix}-3 & 2\\ 4 & -1\end{bmatrix}$ (D) $\frac{1}{5}\begin{bmatrix}-1 & 2\\ -1 & 4\end{bmatrix}$

47. If $\bar{a}=\hat{i}+\hat{j}+\hat{k}$, $\bar{b}=2\hat{i}+\lambda\hat{j}+\hat{k}$, $\bar{c}=\hat{i}-\hat{j}+4\hat{k}$ and $\bar{a}\cdot(\bar{b}\times\bar{c})=10$, then λ is equal to

(A) 6 (B) 7 (C) 9 (D) 10

48. If r.v. $X\sim B(n=5, P=1/3)$ then $P(2<X<4)=$

(A) $80/243$ (B) $40/243$ (C) $40/343$ (D) $80/343$

49. The objective function $z = x_1 + x_2$, subject to $x_1 + x_2 \leq 10$, $-2x_1 + 3x_2 \leq 15$, $x_1 \leq 6$, $x_1, x_2 \geq 0$ has maximum value of the feasible region

(A) at only one point (B) at only two points

(B) at every point of the segment joining two points

(C) at every point of the line joining two points

50. Symbolic form of the given switching circuit (see diagram) is equivalent to

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