MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 19

Paper 2 Mathematics

1. If in a triangle $ABC, 4 \sin A = 4 \sin B = 3 \sin C$, then $\cos C =$

A. $1/3$

B. $1/9$

C. $1/27$

D. $1/18$

Answer: B

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2. $\{x \in R: \cos 2x + 2\cos^2 x = 2\}$ is equal to

A. $\left\{2n\pi + \frac{\pi}{3} : n \in Z\right\}$

B. $\left\{n\pi \pm \frac{\pi}{6} : n \in Z\right\}$

C. $\left\{n\pi + \frac{\pi}{3} : n \in Z\right\}$

D. $\left\{2n\pi - \frac{\pi}{3} : n \in Z\right\}$

Answer: B

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3. If θ and ϕ are acute angles satisfying $\sin\theta = \frac{1}{2}, \cos\phi = \frac{1}{3}$ then $\theta + \phi =$

A. $\left(\frac{\pi}{3}, \frac{\pi}{2}\right)$

B. $\left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$

C. $\left(\frac{2\pi}{3}, \frac{5\pi}{6}\right)$

D. $\left(\frac{5\pi}{6}, \pi\right)$

Answer: B

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4. $\cot^{-1} 9 + \cos ec^{-1}\frac{\sqrt{41}}{4} = \frac{\pi}{4}$

A. $\frac{\pi}{2}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{3}$

D. π

Answer: B

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5. The equation of one of the curves whose slope of tangent at any point is equal to $y+2x$ is $y=2(e^x+x-1)$ $y=2(e^x-x-1)$ $y=2(e^x-x+1)$ $y=2(e^x+x+1)$ (5) $y=e^x-x-1$

A. $y=2(e^x+x-1)$

B. $y=2(e^x-x-1)$

C. $y = 2(e^x - x + 1)$

D. $y = 2(e^x + x + 1)$

Answer: B

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6. $\frac{dy}{dx} = \frac{xy + y}{xy + x}$, then the solution of differential equation is

A. $x + y = \log\left(\frac{cy}{x}\right)$

B. $x + y = \log(cxy)$

C. $x - y = \log\left(\frac{cx}{y}\right)$

D. $y - x = \log\left(\frac{cx}{y}\right)$

Answer: D

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7. The differential equation representing the family of curves $y^2 = 2c\left(x + c^{2/3}\right)$, where c is a positive parameter, is of

A. order 3, degree 3

B. order 2, degree 4

C. order 1, degree 5

D. order 5, degree 1

Answer: C

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8. Prove that the product of the matrices $\begin{bmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{bmatrix}$ and $\begin{bmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^{\beta} \end{bmatrix}$ is the null matrix when α and β differ by an odd multiple of $\frac{\pi}{2}$.

A. 0

B. multiple of π

C. an odd multiple of $\pi/2$

D. None of these

Answer: C

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9. $\int \sqrt{1+\sin\left(\frac{x}{4}\right)}$ dx is equal to

A. $8\left(\sin\frac{x}{8}+\cos\frac{x}{8}\right)+c$

B. $8\left(\sin\frac{x}{8}-\cos\frac{x}{8}\right)+c$

C. $8\left(\cos\text{'(x)/(8)-sin}\frac{x}{8}\right)+c$

D. $\frac{1}{8}\left(\sin\frac{x}{8} - \cos\frac{x}{8}\right) + c$

Answer: B

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10. Area bounded by the curves $4y = |x^2 - 4|$ and $y + |x| = 7$, is equal to :

A. 32

B. 16

C. 24

D. None of these

Answer: A

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11. If $f(t)$ is an odd function, then $\varphi(x)=\int_a^x f(t)dx$ is an even function.

A. an odd function

B. an even function

C. Neither even nor odd

D. 0

Answer: B

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12. If $f(x)$ is a function satisfying $f\left(\frac{1}{x}\right)+x^2f(x)=0$ for all nonzero x , then evaluate $\int_{\sin\theta}^{\cos ec\theta} f(x)dx$

A. 0

B. 1

C. 2

D. 3

Answer: A

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13. The value of $\int_3^5 \frac{x^2}{x^2 - 4}$ dx is

A. $2 - \log_e\left(\frac{15}{7}\right)$

B. $2 + \log_e\left(\frac{15}{7}\right)$

C. $2 + 4 \log_e 3 - 4 \log_e 7 + 4 \log_e 5$

D. $2 - \tan^{-1}\left(\frac{15}{7}\right)$

Answer: B

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14. The plane $2x + 3y + 4z = 1$ meets the coordinate axis in A, B, C. The centroid of the ΔABC is

A. (2, 3, 4)

B. $\left(\frac{1}{2}, \frac{1}{3}, \frac{1}{4}\right)$

C. $\left(\frac{1}{6}, \frac{1}{9}, \frac{1}{12}\right)$

D. $\left(\frac{3}{2}, \frac{3}{3}, \frac{3}{4}\right)$

Answer: C

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15. The equation of straight line equally inclined to the axes and equidistant from the point $(1, -2)$ and $(3, 4)$ is:

A. a = 1, b = -1, c = 3

B. a = 1, b = -1, c = -3

C. a = 1, b = 1, c = -3

D. None of these

Answer: C

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16. Let $P(-1, 0), Q(0, 0), R(3, 3\sqrt{3})$ be three points then the equation of the bisector of the angle $\angle PQR$ is :

A. $\sqrt{3}x + y = 0$

B. $x+\frac{\sqrt{3}}{2}y=0$

C. $\frac{\sqrt{3}}{2}x+y=0$

D. $x+\sqrt{3}y=0$

Answer: A

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17. Let A and B be sets. If $A \cap X = B \cap X = \phi$ and $A \cup X = B \cup X$ for some set X then how that A=B

A. $A - B = A \cap B$

B. $A = B$

C. $B - A = A \cap B$

D. None of the above

Answer: B

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18. Let

$R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9(, (3, 12), (3, 6)\}$

be relation on the set $A = \{3, 6, 9, 12\}$. The relation is-

A. reflexive and symmetric

B. an equivalence relattion

C. reflexive only

D. reflexive and transitive

Answer: D

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19. The first four terms of an AP are a, 9, $3a - b$, $3a + b$.

The 2011 th term of an AP is

A. 2015

B. 4025

C. 5030

D. 8045

Answer: D

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20. The shortest distance between the straight lines $\frac{x-6}{1} = \frac{2-y}{2} = \frac{z-2}{2}$ and $\frac{x+4}{3} = \frac{y}{-2} = \frac{1-z}{2}$ is

A. 9

B. $\frac{25}{3}$

C. $\frac{16}{3}$

D. 4

Answer: B

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21. An urn contains 4 white and 3 red balls. Three balls are drawn with replacement from this urn. Then, the standard deviation of the number of red balls/drawn is

A. $\frac{6}{7}$

B. $\frac{36}{49}$

C. $\frac{5}{7}$

D. $\frac{25}{49}$

Answer: A

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22. Two aeroplanes I and II bomb a target in succession. The probabilities of I and II scoring a hit correctly are 0.3 and 0.2, respectively. The second plane will bomb only if the first misses the target. The probability that the target is hit by the second plane is (1) 0.06 (2) 0.14 (3) 0.2 (3) 0.7

A. 0.06

B. 0.14

C. 0.32

D. 0.7

Answer: C

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23. If $y = \log_2 \log_2(x)$, then $\frac{dy}{dx}$ is equal to

A. $\frac{\log_2 e}{\log_e x}$

B. $\frac{\log_2 e}{x \log_x 2}$

C. $\frac{\log_2 x}{\log_e 2}$

D. $\frac{\log_2 e}{x \log_e x}$

Answer: D

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24. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then det (adj(adj A) is

A. 12^4

B. 13^4

C. 14^4

D. None of these

Answer: C

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25. Dual of $x \wedge (y \vee x) = x$ is

A. $x \vee (y \wedge x) = x$

B. $x \vee (y \vee x) = x$

C. $(x \wedge y) \vee (x \wedge x) = x$

D. None of these

Answer: A

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26. If given constraints are $5x + 4y \geq 2, x \leq 6, y \leq 7,$ then the maximum value of the function $z = x + 2y$ is

A. 13

B. 14

C. 15

D. 20

Answer: D

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27. The angle between the pair of straight lines $y^2 \sin^2 \theta - xy \sin^2 \theta + x^2 (\cos^2 \theta - 1) = 0$ is

A. $\frac{\pi}{3}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{6}$

D. $\frac{\pi}{2}$

Answer: D

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28. The normal to the curve $x = a(\cos\theta + \theta\sin\theta), y = a(\sin\theta - \theta\cos\theta)$ at any θ is such that

A. it is at a constant distance from the origin

B. it passes through $\left(a\frac{\pi}{2}, -a\right)$

C. it makes angle $\frac{\pi}{2} + \theta$ with the X-axis

D. it passes through the origin

Answer: A

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29. If $f(x) = \begin{cases} x^{\alpha}\log x & x > 0 \\ 0 & x = 0 \end{cases}$ and Rolle's theorem is applicable to $f(x)$ for $x \in [0, 1]$ then α may equal to (A) -2 (B)

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

A. -2

B. -1

C. 0

D. $\frac{1}{2}$

Answer: D

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30. if the line $x\cos\alpha + y\sin\alpha = p$ is normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ then

A. $a^2\sin^2\alpha + b^2\cos^2\alpha = p^2$

B. $a^2 + b^2\sin^2\alpha = p^2\cos ec^2\alpha$

C. $a^2\cos^2\alpha + b^2\sin^2\alpha = p^2$

D. None of the above

Answer: C

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31. $\int \sec^{8/9}x \cos ec^{10/9}x$ dx is equal to

A. $-(\cot x)^{1/9} + c$

B. $9(\tan x)^{1/9} + c$

C. $-9(\cot x)^{1/9} + c$

D. $-\frac{1}{9}(\cot x)^9 + c$

Answer: C

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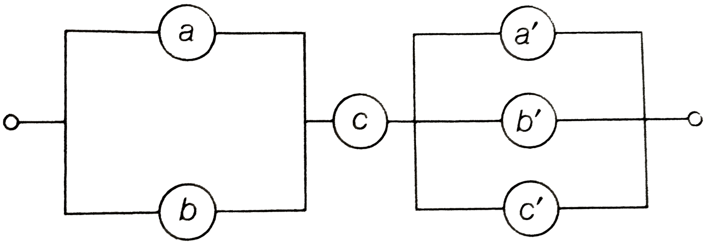
32. Switching function of the network is



A. $(a + b). c + (a' + b' + c')$

B. $(a + b). c. (a' + b' + c')$

C. $(a. b) + c + (a'. b'. c')$

D. None of the above

Answer: B

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33. Find the equation of the plane containing the lines $\frac{x-5}{4}=\frac{y-7}{4}=\frac{z+3}{-5} and \frac{x-8}{7}=\frac{y-4}{1}=\frac{z-5}{3}$.

A. $17x-47y-24z+152=0$

B. $17x+47y-24z+172=0$

C. $17x+47y+24z+172=0$

D. $17x-47y+24z+172=0$

Answer: A

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34. If $\bar{a}, \bar{b}, \bar{c}$ are non coplanar vectors and λ is a real number then $\left[\lambda\left(\bar{a}+\bar{b}\right)\lambda^2\bar{b}\lambda\bar{c}\right]=\left[\bar{a}\bar{b}+\bar{c}\bar{b}\right]$ for

A. exactly two values of λ

B. exactly three values of λ

C. no value of λ

D. exactly one value of λ

Answer: C

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35. If the vectors $\overrightarrow{AB} = 3\hat{i} + 4\hat{k}$ and $\overrightarrow{AC} = 5\hat{i} - 2\hat{j} + 4\hat{k}$ are the sides of a triangle ABC, then the length of the median through A is (A) $\sqrt{33}$ (B) $\sqrt{45}$ (C) $\sqrt{18}$ (D) $\sqrt{720}$

A. $\sqrt{18}$

B. $\sqrt{72}$

C. $\sqrt{33}$

D. $\sqrt{288}$

Answer: C

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36. If $\int \frac{dx}{\cos^3 x \sqrt{\sin 2x}} = a\left(\tan^2 x + b\right)\sqrt{\tan x} + c$

A. $a = \frac{\sqrt{2}}{5}, b = \frac{1}{\sqrt{5}}$

B. $a = \frac{\sqrt{2}}{5}, b = 5$

C. $a = \frac{\sqrt{2}}{5}, b = -\frac{1}{\sqrt{5}}$

D. $a = \frac{\sqrt{2}}{5}, b = \sqrt{5}$

Answer: B

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37. Area bounded by the curve $y = \sin^2 x$ and lines $x = \frac{\pi}{2}, x = \pi$ and X-axis is

A. $\frac{\pi}{2}$ sq unit

B. $\frac{\pi}{4}$ sq unit

C. $\frac{\pi}{8}$ sq unit

D. None of these

Answer: B

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38. If p and q are two statements, then $(p \Rightarrow q) \Leftrightarrow (\sim q \Rightarrow \sim p)$ is

A. contradiction

B. tautology

C. Neither (a) nor (b)

D. None of these

Answer: B

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39. Inequation $y - x \leq 0$ represents

A. the half plane that contains the positive x

B. closed half plane above the line y = x which contains positive Y-axis

C. half plane that contain the negative X-axis

D. None of the above

Answer: A

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40. The 5th term of the series $\frac{10}{9}, \frac{1}{3}\sqrt{\frac{20}{3}}, \frac{2}{3}, \ldots$ is

A. $\frac{1}{3}$

B. 1

C. $\frac{2}{5}$

D. $\sqrt{\frac{2}{3}}$

Answer: C

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41. Let (x,y) be any point on the parabola $y^2 = 4x$. Let P be the point that divides the line segment from (0,0) and (x,y) n the ratio 1:3. Then the locus of P is :

A. $x^2 = y$

B. $y^2 = 2x$

C. $y^2 = x$

D. $x^2 = 2y$

Answer: C

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42. Equation of the ellipse whose foci are $(2, 2)$ and $(4, 2)$ and the major axis is of length 10 is

A. $\frac{(x+3)^2}{24}+\frac{(y+2)^2}{25}=1$

B. $\frac{(x-3)^2}{24}+\frac{(y-2)^2}{25}=1$

C. $\frac{(x+3)^2}{25}+\frac{(y+2)^2}{24}=1$

D. $\frac{(x-3)^2}{25}+\frac{(y-2)^2}{24}=1$

Answer: D

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43. $\frac{\sin 5\theta+\sin 3\theta}{\cos 5\theta+\cos 3\theta}$ is equal to

A. $\sin 4\theta$

B. $\cos 4\theta$

C. $\tan 4\theta$

D. None of these

Answer: C

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44. For the two circles $x^2 + y^2 = 16$ and $x^2 + y^2 - 2y = 0$, there is/are

A. one pair of common tangents

B. only one common tangent

C. three common tangents

D. no common tangent

Answer: D

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45. Consider the inequalities $x_1 + x_2 \leq 3, 2x_1 + 5x_2 \geq 10x_1, x_2 \geq 0$ which of the following point does not lie in the feasible region ?

A. (2, 2)

B. (1, 2)

C. (2, 1)

D. (4, 2)

Answer: C

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46. Suppose the cubic $x^3 - px + q$ has three distinct real roots, where $p > 0$ and $q > 0$. Then which one of the following holds?

A. The cubic has maxima at both $\sqrt{\frac{\rho}{3}}$ and $-\sqrt{\frac{\rho}{3}}$

B. The cubic has minima at $\sqrt{\frac{\rho}{3}}$ and maxima at $-\sqrt{\frac{\rho}{3}}$

C. The cubic has minima at $-\sqrt{\frac{\rho}{3}}$ and maxima at $\sqrt{\frac{\rho}{3}}$

D. The cubic has minima at both $\sqrt{\frac{\rho}{3}}$ and $-\sqrt{\frac{\rho}{3}}$

Answer: B

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47. If $f(x+y) = f(x)f(y)$ for all real x and y, $f(6) = 3$ and $f'(0) = 10$, then f'(6) is

A. 30

B. 13

C. 10

D. 0

Answer: A

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48. A ladder 10 m long rests against a vertical wall with the lower end on the horizontal ground. The lower end of the ladder is pulled along the ground away from the wall at the rate of 3 m/s. The height of the upper end while it is descending at the rate of 4 m/s, is

A. $4\sqrt{3}$ m

B. $5\sqrt{3}$ m

C. $5\sqrt{2}$ m

D. 6 m

Answer: D

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49. If $ax^2 + bx + 4$ attains its minimum value -1 at x = 1, then the values of a and b are respectively

A. 5, -10

B. 5, -5

C. 5, 5

D. 10, -5

Answer: A

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50. The equation of the tangent to the curve $y = (2x - 1)e^{2(1-x)}$ at the point of its maximum, is

A. $y - 1 = 0$

B. $x - 1 = 0$

C. $x + y - 1 = 0$

D. $x - y + 1 = 0$

Answer: A

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