MATHS

BOOKS - ACCURATE PUBLICATION

SAMPLE QUESTION PAPER-IX

Section A

1. The relation R in R defined as $R = \{(a, b) : a \leq b\}$, is reflexive and transitive but not symmetric.

A. Reflexive and Symmetric

B. Symmetric and Transitive

C. Reflexive and Transitive

D. None of these

Answer: C

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2. $\tan^{-1}\sqrt{3} - \cot^{-1}(\sqrt{3})$ is equal to

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

B. $-\frac{\pi}{2}$

C. 0

D. $2\sqrt{3}$

Answer: B

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3. X, Z are matrices of order $2 \times n$, $2 \times p$ respectively.

If n = p, then the order of the matrix 7X - 5Z is :

A. $p \times 2$

B. $2 \times n$

C. $n \times 3$

D. $p \times n$

Answer: B

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4. Solution of $\begin{bmatrix} 2 & -3 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$ is given by

A. x = 2, y = 1

B. x = 1, y = 2

C. x = 2, y = 2

D. x = 2, y = 3

Answer: A

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5. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, then A + A' is

A. $\begin{pmatrix} 2 & 0 \\ 5 & 8 \end{pmatrix}$

B. $\begin{pmatrix} 2 & 5 \\ 5 & 8 \end{pmatrix}$

C. $\begin{pmatrix} 2 & 5 \\ 0 & 8 \end{pmatrix}$

D. $\begin{pmatrix} 1 & 5 \\ 5 & 4 \end{pmatrix}$

Answer: B

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6. The constant k, so that the $f(x) = \begin{cases} \frac{x^2-2x-3}{x+1} & \text{if } x \neq -1 \\ k & \text{if } x = -1 \end{cases}$ is continuous at x = -1 is

A. -1

B. -2

C. -4

D. -5

Answer: C

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7. Derivative of $\left(\sec^{-1} x + \operatorname{cosec}^{-1} x\right)$ w.r.t. x is

A. -1

B. 0

C. 1

D. 2

Answer: B

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8. Differentiate $\tan^{-1}\left(\frac{\sin x}{1+\cos x}\right)$ w.r.t.x

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

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

C. $\frac{1}{4}$

D. $\frac{1}{5}$

Answer: B

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9. $\int \frac{10x^9 + 10^x \log_e 10}{x^{10} + 10^x}$ dx is equal to :

A. $10^x - x^{10} + C$

B. $10^x + x^{10} + C$

C. $\left(10^x - x^{10}\right)^{-1} + C$

D. $\log\left(10^x + x^{10}\right) + C$

Answer: D

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10. Evaluate the following integrals:

$$\int e^x \left(\tan^{-1} x + \frac{1}{1+x^2}\right) dx$$

A. $e^x + c$

B. $\tan^{-1} x + c$

C. e^(2x) tan^(-1) x + c`

D. $e^x \tan^{-1} x + c$

Answer: D

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11. Find the particular solution of $\log\left(\frac{dy}{dx}\right) = 2x + 3y$ given that $x = 0, y = 0$.

A. $-\frac{1}{3}e^{-3y} = \frac{1}{2}e^{2x} - \frac{5}{6}$

B. $-\frac{1}{2}e^{-3y} = \frac{1}{3}e^{2x} - \frac{5}{6}$

C. $-\frac{1}{3}e^{-3y} = \frac{1}{4}e^{2x} - \frac{5}{6}$

D. $-\frac{1}{4}e^{-3y} = \frac{1}{3}e^{2x} - \frac{5}{6}$

Answer: A

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12. The general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$ is:

A. $e^x + e^{-y} = C$

B. $e^x + e^y = C$

C. $e^{-x} + e^y = C$

D. $e^{-x} + e^{-y} = C$

Answer: A

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13. If $\vec{a} = \hat{i} - \hat{j} + 7\hat{k}$ and $\vec{b} = 5\hat{i} - \hat{j} + \lambda\hat{k}$, then $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular vectors when λ is

A. $\lambda = \pm 2$

B. $\lambda = \pm 3$

C. $\lambda = \pm 4$

D. $\lambda = \pm 5$

Answer: D

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14. Write the value of: $\left(\hat{i}.\left(\hat{j} \times \hat{k}\right) + \hat{j}\left(\hat{i} \times \hat{k}\right) + \hat{k}.\left(\hat{I} \times \hat{j}\right)\right.$

A. 1

B. -1

C. 3

D. 0

Answer: C

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15. The length of the perpendicular drawn from the origin to the plane $2x - 3y + 6z + 21 = 0$.

A. 3

B. 4

C. 5

D. 2

Answer: A

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16. An urn contains 6 red and 4 blue balls. Two balls are drawn at random with replacement. The probability of getting 2 red balls is

A. $\frac{8}{25}$

B. $\frac{9}{25}$

C. $\frac{11}{25}$

D. $\frac{13}{25}$

Answer: B

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17. Range of the function $f(x) = \frac{|x-4|}{x-4}$ is.....

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18. A (adj A) = ...

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19. If $y = ae^{mx} + be^{-mx}$, then $\frac{d^2y}{dx^2} - m^2y$ = ...

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20. The function f(x) = 7x - 3 is a strictly.....function on R.

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21. $\int x^n \log x dx$ = ...

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22. I.F. of $x\frac{dy}{dx} + y = x \log x$ is .....

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23. A line makes angles of 45° and 60° with the positive axes of x and y respectively. The line makes an angle.....with the positive axis of z.

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24. The events E and F are given to be independent. If it is given that P(E) = 0.35 and $P(E \cup F) = 0.60$, then P(F) = ...

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25. $\cos^{-1} x = (\cos x)^{-1}$

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26. $(ABC)^{-1} = C^{-1}B^{-1}A^{-1}$

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27. $\frac{d}{dx}(x^x) = x\left(x^{x-1}\right)$

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28. $prove: \int \frac{1}{(\log x)x} dx = \log(\log x) + c.$

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29. The vectors $\vec{a} = 3\hat{i} + x\hat{j}$ and $\vec{b} = 2\hat{i} + \hat{j} + y\hat{k}$ are mutually perpendicular. If $\left|\vec{a}\right| = \left|\vec{b}\right|$, then $y = \pm 2\sqrt{10}$.

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30. If a line makes angle $90^\circ, 135^\circ, 45^\circ$ with X,Y and Z-axis respectively, then its direction cosines are

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31. One card is drawn from a well-shuffled pack of 52 cards. E is the event "the card drawn is a king or queen" and F is the event " the card drawn is a queen or an ace ". Then find the probability of the conditional event E/F .

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32. The point which does not lie in the half-plane $3x + 7y - 32 \leq 0$ is

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Section B

1. Using prperties of determinants, prove that :

$$\begin{vmatrix} 1 & 1 & 1+3x \\ 1+3y & 1 & 1 \\ 1 & 1+3z & 1 \end{vmatrix} = 9(3xyz + xy + yz + zx).$$

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2. If $\begin{bmatrix} 2x+y & 3y \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 6 & 4 \end{bmatrix}$ then find x

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3. Find for which values of 'x', the functions: $y = x^4 - \frac{4x^3}{3}$ is increasing and for which values, it is decreasing.

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4. Find the equation of the tangent at $t = \frac{\pi}{4}$ to the curve: x = sin 3t, y = cos 2t.

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5. Find : $\int \sin^{-1}(2x)dx.$

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6. Find the area of the region bounded by ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$.

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7. Find the magnitude of each of the two vectors $\vec{a}$ and $\vec{b}$, having the same magnitude such that the angle between them in 60° and their scalar product is $\frac{9}{2}$.

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8. Find the sine of the angle between the vectors $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 3\hat{i} + 4\hat{j} - \hat{k}$. Also find a unit vector perpendicular to both the vectors.

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Section C

1. Simplify : $\cot^{-1}\left(\sqrt{1+x^2}-x\right)$.

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2. If $y = x^{\tan x} + (\tan x)^x$ then find $\frac{dy}{dx}$.

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3. If sin y = x sin (a + y), then prove that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$.

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4. Show that : $\int_0^{\pi} \frac{x}{1+\sin x} dx = \pi$.

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5. Solve the following differential equations

$$\left(x \sin \frac{y}{x}\right) dy = \left(y \sin \frac{y}{x} - x\right) dx$$

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6. Solve : $\frac{dy}{dx} + y \sec x = \tan x.$

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7. From a lot of 20 bulbs which include 5 defectives, a sample of 3 bulbs is drawn at random one by one with replacement. Find the probability distribution of the number of defective bulbs. Also, find the mean of the distribution.

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Section D

1. Solve the following system of linear equations by matrix method : $2x - 3y + 5z = 11, 3x + 2y - 4z = -5, x + y - 2z = -3$

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2. If $A = \begin{bmatrix} 2 & 2 \\ -2 & 1 \end{bmatrix}$, Find A^{-1}.

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3. Find the distance of the point $(-1, -5, -10)$ from the point of intersection of the line $\vec{r} = 2\hat{i} - \hat{j} + 2\hat{k} + \lambda\left(3\hat{i} + 4\hat{j} + 2\hat{k}\right)$ and the plane $\vec{r} \cdot \left(\hat{i} - \hat{j} + \hat{k}\right) = 5$

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4. Find the equations of the plane through the line of intersection of $\vec{r}.\left(2\hat{i}-3\hat{j}+4\hat{k}\right)=1$ and $\vec{r}.\left(\hat{i}-\hat{j}\right)+4=0$ and perpendicular to the plane $\vec{r}.\left(2\hat{i}-\hat{j}+\hat{k}\right)+8=0$. Hence find whether the plane thus obtained contains the line x - 1 = 2y - 4 = 3z - 12.

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5. Solve the following linear programming problem graphically:

Miximise $Z=5x+3y$ subject to the constraints :

$3x+5y\leq 15$

$5x+2y\leq 10$

$x\geq 0, y\geq 0$

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6. Solve the following linear programming problem graphically:

Miximise $Z = x + 2y$ subject to the constraints :

$x + 2y \geq 100$

$2x - y \leq 0$

$2x + y \leq 200$

$x \geq 0, y \geq 0$

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