MATHS

BOOKS - ACCURATE PUBLICATION

SAMPLE QUESTION PAPER-VIII

Section A

1. Let A = {0, 1, 2, 3} and define a relation R on A as follows :

$R = \{(0, 0), (0, 1), (0, 3), (1, 0), (1, 1), (2, 2), (3, 0), (3, 3)\}$

Is R reflexive ? symmetric ? transitive ?

A. Reflexive

B. Symmetric

C. Transitive

D. None of these

Answer: C

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2. Principal value of $\sin^{-1}\left(\frac{1}{2}\right) + \cos^{-1}\left(-\frac{1}{2}\right)$ is

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

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

C. $\frac{3\pi}{2}$

D. None of these

Answer: A

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3. If $A = \begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is such that $A^2 = I$, then

a. 1 + $\alpha^2 + \beta\gamma = 0$

b. 1 – $\alpha^2 + \beta\gamma = 0$

c. 1 – $\alpha^2 - \beta\gamma = 0$

d. 1 + $\alpha^2 - \beta\gamma = 0$

A. $1 + \alpha^2 + \beta\gamma = 0$

B. $1 - \alpha^2 + \beta\gamma = 0$

C. $1 - \alpha^2 - \beta\gamma = 0$

D. $1+\alpha^2-\beta\gamma=0$

Answer: C

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4. Solve the matrix equation :

$$\begin{pmatrix} 1 & x & 1 \end{pmatrix}\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 3 & 2 & 5 \end{pmatrix}\begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}=(0)$$

A. $-\frac{9}{8}$

B. $-\frac{5}{8}$

C. $-\frac{4}{9}$

D. $-\frac{5}{7}$

Answer: A

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5. The matrix $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ is

A. a unit matrix

B. a diagonal matrix

C. a symmetric matrix

D. a skew-symmetric matrix

Answer: D

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6. The value of k so that the function

$f(x)=\begin{cases}kx^2 & , \quad x \geq 1 \\ 4 & , \quad x < 1\end{cases}$ is continuous at x = 1 is

A. 1

B. 2

C. 3

D. 4

Answer: D

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7. Derivative of $\cos^{-1}(\sin x)$ w.r.t. x equals

A. -1

B. 1

C. cos x

D. sin x

Answer: A

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

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

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

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

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

Answer: A

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9. $\int \frac{\cos 2x}{(\sin x + \cos x)^2} dx$ is equal to

A. $\frac{-1}{\sin x + \cos x} + C$

B. $\log|\sin x + \cos x| + C$

C. $\log|\sin x - \cos x| + C$

D. $\frac{1}{(\sin x + \cos x)^2}$

Answer: B

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10. $\int_1^2 \left(\log x^2\right) dx$ equals

A. $4 \log 2 - 2$

B. $4 \log 2 - 3$

C. $3 \log 2 - 2$

D. $3 \log 2 - 4$

Answer: A

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11. Solution of $x^5 \frac{dy}{dx} = - y^5$ is

A. $x^{-2} + y^{-2} = c$

B. $x^{-4} + y^{-4} = c$

C. $x^{-3} + y^{-3} = c$

D. $x^{-5} + y^{-5} = c$

Answer: B

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12. The general solution of differential equation : $ydy + xdx = 0$ is :

A. $x^2 + y^2 = c$

B. $y^2 = x^2 + c$

C. $y^2 = cx^2$

D. $x^2y^2 = c^2$

Answer: A

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13. Vector in the direction of vector $2\hat{i} - 3\hat{j} + 6\hat{k}$ which has magnitude 21 units is

A. $2\left(2\hat{i} - 3\hat{j} + 6\hat{k}\right)$

B. $4\left(2\hat{i} - 3\hat{j} + 6\hat{k}\right)$

C. $3\left(2\hat{i} - 3\hat{j} + 6\hat{k}\right)$

D. $5\left(2\hat{i} - 3\hat{j} + 6\hat{k}\right)$

Answer: C

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14. If $\sqrt{3}\left|\vec{a}\,.\,\vec{b}\right| = \left|\vec{a} \times \vec{b}\right|$, then angle between $\vec{a}$ and $\vec{b}$ is

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

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

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

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

Answer: A

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15. The distance of the point (3, 4, 5) from the plane $\overrightarrow{r}.\left(2\hat{i}-5\hat{j}+3\hat{k}\right)=13$

A. $\frac{8}{\sqrt{38}}$

B. $\frac{10}{\sqrt{38}}$

C. $\frac{12}{\sqrt{38}}$

D. $\frac{14}{\sqrt{38}}$

Answer: C

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16. If $P\left(\frac{A}{B}\right)>P(A)$, then which of the following is correct : :

A. $P(B \mid A) < P(B)$

B. $P(A \cap B) < P(A).\,P(B)$

C. $P(B \mid A) > P(B)$

D. $P(B \mid A) = P(B)$

Answer: C

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17. Range of $f(x) = \begin{cases} 1 & \text{if} \quad x > 0 \\ 0 & \text{if} \quad x = 0 \\ -1 & \text{if} \quad x < 0 \end{cases}$ is......................

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18. The matrix $A = \begin{bmatrix} 0 & 1 & -1 \\ -1 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ is a .... matrix.

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19. Derivative of $\tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$ w.r.t. x is.......................

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20. The interval in which $y = x^2 e^{-x}$ is strictly increasing is

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21. $\int \frac{\sin^{-1} x}{\sqrt{1-x^2}} dx$ = ...

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22. I.F. of $\frac{dy}{dx} + \frac{y}{x} = e^x, (x > 0)$ is..........................

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23. Find the equation of the plane with intercept 3 on the y-axis and parallel to ZOX plane.

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24. If $2P(A) = P(B) = \frac{7}{15}$ and $P(A/B) = \frac{2}{7}$ then find $P(A \cup B)$.

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25. $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ is equal to $-\frac{\pi}{3}$.

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26. Value of $\begin{vmatrix} 42 & 1 & 6 \\ 28 & 7 & 4 \\ 14 & 3 & 2 \end{vmatrix}$ is 1?

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27. If $y = \sin^{-1} x$, then prove that

$$\frac{d^2y}{dx^2} = \frac{x}{(1-x^2)^{\frac{3}{2}}}.$$

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28. $\int [f(x)]^n f'(x) dx = \frac{[f(x)]^{n+1}}{n+1} + c, n \neq -1$

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29. If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{c} = -\hat{i} + 3\hat{j} + \hat{k}$, then $\vec{a} . \left(\vec{c} \times \vec{a}\right)$ is 2.

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30. Show that the D.C.'s of the perpendicular from origin to the plane $\vec{r}.\left(-2\hat{i}-3\hat{j}+6\hat{k}\right)+14=0 \text{are} \frac{2}{7}, \frac{3}{7}, -\frac{6}{7}.$

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31. Let E and F be two events associated with the same random experiment, then E and F are said to be independent if $P(E \cap F) = P(E). P(F)$.

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32. Corner points of the feasible region for an LPP are (0, 2), (3, 0), (6, 8) and (0, 5).

Let F = 4x + 6y be the objective function.

The Maximum of F - Minimum of F = 60

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Section B

1. If matrix $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $A^2 = kA$, then write the value of 'k'.

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2. Find the adjoint of the following matrices :

$$\begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$$

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3. Find the equation of the tangent line to the curve $y = x^2 - 2x + 7$ which is parallel to the line $2x + y + 9 = 0.$

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4. Evaluate $\int \frac{dx}{\sqrt{5 - 4x - 2x^2}}$

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5. Integrate the following functions : $\frac{(x-3)e^x}{(x-1)^3}.$

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6. Using definite integrals, find the area of the circle $x^2 + y^2 = 16.$

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7. For what values of λ are the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} - \hat{k}$ and $\vec{b} = 4\hat{i} - 2\hat{j} - 2\hat{k}$ perpendicular to each other ?

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8. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes 1 and 2 respectively and when $\left|\vec{a} \times \vec{b}\right| = \sqrt{3}$.

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Section C

1. Prove that

$$\sin^{-1}\frac{5}{13} + \cos^{-1}\frac{3}{5} = \sin^{-1}\frac{63}{65}$$

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2. Write the principle value of $\tan^{-1}(1) + \cos^{-1}\left(\frac{1}{2}\right)$.

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3. Find $\frac{dy}{dx}$ when :

$$y = x^{\sin x - \cos x} + \frac{x^2 - 1}{x^2 + 1}$$

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4. if $y = \sin^{-1}\left(\frac{5x + 12\sqrt{1 - x^2}}{13}\right)$ then find $\frac{dy}{dx}$

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5. Evaluate: $\int e^{-\frac{x}{2}} \frac{\sqrt{1 - \sin x}}{1 + \cos x} dx$

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6. Prove that : $\int_0^1 x(1-x)^n dx = \frac{1}{(n+1)(n+2)}$

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7. Solve the following differential equations

$xdy - (y + 2x^2)dx = 0$

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8. A bag contains 4 red and 4 black balls, another bag contains 2 red and 6 black balls. One of the two bags is selected at random and a ball is drawn from the bag which is found to be red. Find the probability that the ball is drawn from the first bag.

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Section D

1. Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations $x - y + 2z = 1, 2y - 3z = 1, 3x - 2y + 4z = 2$

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2. A school wants to award its students for regularity and hard work with a total cash award of Rs. 6,000. If three times the award money for hard work added to that given for regularity amounts to Rs. 11,000, represent the above situation algebraically and find the award money for each value, using matrix method.

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3. Find the equation of plane passing through the points A(2, -1, 1), B(4, 3, 2) and C(6, 5, -2). Also prove that point $\left(5, -1, -\frac{25}{2}\right)$ lies on the plane given by points A, B and C.

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4. Find the shortest distance between the lines : $\frac{x+1}{4}=\frac{y-3}{-6}=\frac{z+1}{1}$ and $\frac{x+3}{3}=\frac{y-5}{2}=\frac{z-7}{6}$.

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5. Maximize $z=15x+5y$, subject to the constraints

$2x+3y\leq 12$

$3x+2y\leq 12$

$x\geq 0, y\geq 0$

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6. Solve the following problem graphically :

Minimise and Maximise Z = 3x + 9y

subject to the constraints :

$x + 3y \leq 60$

$x + y \geq 10$

$x \leq y$

$x \geq 0, y \geq 0$

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