MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER - 1

Part I Choose The Correct Answer

1. A= $\begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$, B=adj A and C =3A, then $\frac{|adjB|}{|C|}$=

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

B. $\frac{1}{9}$

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

D. 1

Answer: B

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2. If the inverse of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}^n$ is $\frac{1}{11}\begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then the ascending order of a, b, c, d is

A. a, b, c, d

B. d, b, c, a

C. c, a, b, d

D. b, a, c, d

Answer: B

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3. The least value of n satisfying $\left[\frac{\sqrt{3}}{2} + \frac{i}{2}\right]^n = 1$ is

A. 30

B. 24

C. 12

D. 18

Answer: C

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4. The principal argument of $\frac{3}{-1+i}$ is

A. $-\frac{5\pi}{6}$

B. $\frac{-2\pi}{3}$

C. $\frac{-3\pi}{4}$

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

Answer: C

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5. The polynomial $x^3 + 2x + 3$ has :

A. one negative and two imaginary

B. one positive and two imaginary roots

C. three real roots

D. no solution

Answer: A

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6. The domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$ is

A. [1, 2]

B. [-1, 1]

C. [0, 1]

D. [-1, 0]

Answer: A

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7. If x + y = k is a normal to the parabola $y^2 = 12x$ then the value of k is

A. 3

B. -1

C. 1

D. 9

Answer: D

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8. The circle passing through (1,-2) and touching the axis of x at (3,0) passing through the point

A. (-5, 2)

B. (2, -5)

C. (5, -2)

D. (-2, 5)

Answer: C

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9. The volume of the parallelepiped with its edges represented by the vectors $\hat{i}+\hat{j}, \hat{i}+2\hat{j}, \hat{i}+\hat{j}+\pi\hat{k}$ is

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

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

C. π

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

Answer: C

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10. If the line $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$ lies in the plane $x+3y-az+\beta=0$ then $($ is

A. (-5, 5)

B. (-6, 7)

C. (5, -5)

D. (6, -7)

Answer: B

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11. The function $\sin^4 x+\cos^4 x$ is increasing in the interval

A. $\left[\frac{5\pi}{8},\frac{3\pi}{4}\right]$

B. $\left[\frac{\pi}{2}, \frac{5\pi}{8}\right]$

C. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

D. $\left[0, \frac{\pi}{4}\right]$

Answer: C

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12. The curve $y = ax^4 + bx^2 \quad \text{with} \quad ab > 0$

A. has no horizontal tangent

B. is concave up

C. is concave down

D. has no points of inflection

Answer: D

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13. If $u = (x - y)^2$, then $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y}$ is

A. 1

B. -1

C. 0

D. 2

Answer: C

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14. The value of $\int_0^{\pi} \frac{dx}{1 + 5^{\cos x}}$ is :

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

B. π

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

D. 2π

Answer: A

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15. The volume of solid of revolution of the region bounded by $y^2 = x(a - x)$ about x-axis is

A. πa^3

B. $\frac{\pi a^3}{4}$

C. $\frac{\pi a^3}{5}$

D. $\frac{\pi a^3}{6}$

Answer: D

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16. If m, n are the order and degree of the differential equation $\left[\frac{d^4y}{dx^4} + \frac{d^2y}{dx^2}\right]^{\frac{1}{2}} = a\frac{d^2y}{dx^2}$ respectively, then the value of $4m - n$ is

A. 15

B. 12

C. 14

D. 13

Answer: A

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17. The solution of the differential equation $\frac{dy}{dx} = \frac{y}{x} + \frac{\phi\left(\frac{y}{x}\right)}{\phi'\left(\frac{y}{x}\right)}$ is

A. $x\varphi\left(\frac{y}{x}\right) = k$

B. $\varphi\left(\frac{y}{x}\right) = kx$

C. $y\varphi\left(\frac{y}{x}\right) = k$

D. $\varphi\left(\frac{y}{x}\right) = kx$

Answer: B

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18. A random variable X has the following distribution.

x	1	2	3	4
$p(X=x)$	c	$2c$	$3c$	$4c$

then the value of c is ..... .

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: A

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19. If P{X=0}=1-P{X=1}. If E{X}=3Var(X), then P{X=0} is

A. $\frac{2}{3}$

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

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

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

Answer: C

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20. Which one is the contrapositive of the statement $(p \vee q) \rightarrow r$?

A. $\neg r \rightarrow (\neg p \wedge \neg q)$

B. $\neg r \rightarrow (p \vee q)$

C. $r \rightarrow (p \wedge q)$

D. $p \rightarrow (q \vee r)$

Answer: A

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Part Ii Answer The Questions

1. Solve the following system of linear equations by Cramer's rule 2x - y = 3, x + 2y = -1.

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2. If z_1, z_2 and z_3 are complex numbers such that $|z_1| = |z_2| = |z_3| = |z_1 + z_2 + z_3| = 1$, find the value of $\left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right|$.

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3. Find the value of $\sin\left(\frac{\pi}{3} + \cos^{-1}(-1)\right)$

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4. Find the equation of the parabola with vertex (-1, -2), axis parallel to y-axis and passing through (3, 6).

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5. If $\hat{a}, \hat{b}, \hat{c}$ are three unit vectors such that $\hat{b}$ and $\hat{c}$ are non-parallel and $\hat{a} \times \left(\hat{b} \times \hat{c}\right) = \frac{1}{2}\hat{b}$, find the angle between $\vec{a}$ and $\vec{c}$.

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6. If the mass m(x) (in kilograms) of a thin rod of length x(in metres) is given by, $m(x) = \sqrt{3x}$ then what is the rate of change of mass with respect to the length when it is x = 27 meters.

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7. Evaluate : $\int_0^{\infty} e^{-ax} x^n dx$, where $a > 0$.

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8. Show that $y = ax + \frac{b}{x}, x \neq 0$ is a solution of the differential equation $x^2y'' + xy' - y = 0$.

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9. Find the mean of a random variable X, whose probability density function is $f(x) = \begin{cases} \lambda e^{-\lambda x} & \text{for } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$.

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10. Let $*$ be a binary operation on set Q of rational numbers defined as $a * b = \frac{ab}{8}$. Write the identity for $*$, If any.

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Part Iii Answer The Questions

1. Find the inverse of $\begin{bmatrix} 2 & -1 \\ 5 & -2 \end{bmatrix}$ by Gauss Jorden method.

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2. If $\omega \neq 1$ is a cube root of unity, show that the roots of the equation $(z-1)^3 + 8 = 0$ are $-1, 1-2\omega, 1-2\omega^2$.

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3. Find all real numbers satisfying $4^x - 3\left(2^{x+2}\right) + 2^5 = 0$

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4. Find the centre, foci and eccentricity of the hyperbola $12x^2 - 4y^2 - 24x + 32y - 127 = 0$

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5. Find the image of the point whose position vector is $\hat{i} + 2\hat{j} + 3\hat{k}$ in the plane $\vec{r} \cdot \left(\hat{i} + 2\hat{j} + 4\hat{k}\right) = 38$.

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6. Evaluate : $\lim_{x \to 0^+} x \log x$.

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7. Find a linear approximation for the following functions at the indicated points.

$f(x) = x^3 - 5x + 12, x_0 = 2$

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8. By using the properties of definite integrals, evaluate $\int_0^3 |x - 1| dx$

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9. Solve : $\frac{dy}{dx} + 2y \cot x = 3x^2 \text{cosec}^2 x.$

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10. A fair coin is tossed a fixed number of times. If the probability of getting seven heads is equal to that of getting nine heads, find the probability of getting exactly two heads.

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Part Iv Answer The Questions

1. By using Gaussian elimination method, balance the chemical reaction equation:

$C_2H_6 + O_2 \rightarrow H_2O + CO_2.$

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2. If z = x + iy and $\arg\left(\frac{z-i}{z+2}\right)=\frac{\pi}{4}$. Show that $x^2+y^2+3x-3y+2=0$.

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3. Solve the equation :

$3x^4-16x^3+26x^2-16x+3=0$

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4. Solve : $\tan^{-1}\left(\frac{x-1}{x-2}\right)+\tan^{-1}\left(\frac{x+1}{x+2}\right)=\frac{\pi}{4}$

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5. A rod of length 1.2 m moves with its ends always touching the coordinate axes. The locus of a point Pon the rod, which is 0.3 m from the

end in contact with x-axis is an ellipse. Find the eccentricity.

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6. Find the non-parametric and Cartesian equations of the plane passing through the point (4, 2, 4) and is perpendicular to the planes 2x + 5y + 4z + 1 = 0 and 4x + 7y + 6z + 2 = 0.

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7. A steel plant is capable of producing x tonnes per day of a law-grade steel and y tonnes per day of a hight-grade steel, where $y = \frac{40 - 5x}{10 - x}$. If the fixed market price of low-grade steel is half that of high-grade steel, then what should be optimal productions in law-grade steel and high-grade steel in order to have maximum receipts.

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8. Let $z(x, y) = xe^y + ye^{-x}, x = e^{-t}, y = st^2, s, t \in \mathbb{R}$. Find $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$.

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9. Find the area of the region bounded between the parabola $x^2 = y$ and the curve y=|x|.

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10. Water at temperature $100^\circ C$ cools in 10 minutes to $80^\circ C$ in a room temperature of $25^\circ C$.

Find

(i) The temperature of water after 20 minutes

(ii) The time when the temperature is $40^\circ C$

$\left[\log_e \frac{11}{15} = -0.3101, \log_e 5 = 1.6094\right]$

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11. Suppose a discrete random variable can only take the values 0, 1, and 2.

The probability mass function is defined by

$$f(x) = \begin{cases} \frac{x^2+1}{k}, & \text{for x=0,1,2} \\ 0 & \text{otherwise} \end{cases}$$

Find (i) the value of k (ii) cumculative distribution function (iii) $P(X \geq 1)$.

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12. Using truth table check whether the statements $\sim(p \vee q) \vee (\sim p \wedge q)$ and $\sim p$ are logically equivalent.

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13. Prove by vector method that $\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$.

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14. Find the equations of tangent and normal to the curve $y^2 - 4x - 2y + 5 = 0$ at the point where it cuts the x-axis.

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