MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER -15 (UNSOLVED)

Part I Choose The Correct Answer

1. If A $\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$, then A=

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

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

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

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

Answer: C

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2. If $\frac{z-1}{z+1}$ is purely imaginary, then |z| is

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

B. 1

C. 2

D. 3

Answer: B

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3. If $z_1 = a + ib$, $z_2 = -a + ib$ then $z_1 - z_2$ lies on .....

A. real axis

B. imaginary axis

C. the line y=x

D. the line y=-x

Answer: A

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4. A polynomial equation in x of degree n always has :

A. n distinct roots

B. n real roots

C. n imaginary roots

D. at most one root.

Answer: C

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5. If $\sin^{-1} x = 2\sin^{-1} \alpha$ has a solution, then

A. $|\alpha| \leq \frac{1}{\sqrt{2}}$

B. $|\alpha| \geq \frac{1}{\sqrt{2}}$

C. $|\alpha| < \frac{1}{\sqrt{2}}$

D. $|\alpha| > \frac{1}{\sqrt{2}}$

Answer: A

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6. The value of $\cos^{-1}(-1) + \tan^{-1}(\infty) + \sin^{-1}1 = \ldots\ldots$

A. $-\pi$

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

C. 30°

D. 2π

Answer: D

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7. The equation of the circle passing through (1,5) and (4,1) and touching y-axis is $x^2 + y^2 - 5x - 6y + 9 + \lambda(4x + 3y - 19) = 0$ where λ is equal to

A. $0, \ -\frac{40}{9}$

B. 0

C. $\frac{40}{9}$

D. $\frac{-40}{9}$

Answer: A

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8. The point of contact of the tangent $2x + 3y + 9 = 0$ to the parabola $y^2 = 8x$ is:

A. $\left(\frac{am^2}{c}, \frac{b^2}{c}\right)$

B. $\left(\frac{a^2m}{c}, \frac{b^2}{c}\right)$

C. $\left(\frac{-a^2m}{c}, \frac{-b^2}{c}\right)$

D. $\left(\frac{-am^2}{c}, \frac{-b^2}{c}\right)$

Answer: C

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9. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{b} = \hat{i} + \hat{j}, \vec{c} = \vec{i}$ and $\left(\vec{a} \times \vec{b}\right) \times \vec{c} = \lambda \vec{a} + \mu \vec{b}$ then

the value of $\lambda + \mu$ is._____

A. 0

B. 1

C. 6

D. 3

Answer: A

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10. The value of $\hat{i}.\left(\hat{j}\times\hat{k}\right)+\hat{j}.\left(\hat{k}\times\hat{i}\right)+\hat{k}.\left(\hat{i}\times\hat{j}\right)=$ .....

A. 1

B. 3

C. -3

D. 0

Answer: B

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11. What is the value of the limit $\lim_{x \to 0} \left(\cot x - \frac{1}{x} \right)$?

A. 0

B. 1

C. 2

D. ≤ 2

Answer: A

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12. If u(x,y) $= e^{x^2+y^2}$, then $\frac{\partial u}{\partial x}$ is equal to

A. $e^{x^2+y^2}$

B. $2xu$

C. x^2u

D. y^2u

Answer: B

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13. If $f(x, y)$ is homogeneous function of degree 5 then $x\frac{\partial f}{\partial x} + y\frac{\partial f}{\partial y} =$

A. f

B. nf

C. $n(n-1)$

D. $n(n+1)f$

Answer: B

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14. The area between $y^2 = 4x$ and its latus rectum is

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

B. $\frac{4}{3}$

C. $\frac{8}{3}$

D. $\frac{5}{3}$

Answer: C

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15. If $\int_0^{2a} f(x)dx = 2\int_0^{a} f(x)$ then

A. $f(2a - x) = f(x)$

B. $f(a - x) = f(x)$

C. $f(x) = -f(x)$

D. $f(-x) = f(x)$

Answer: A

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16. The general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x}$ is

A. $xy = k$

B. $y = k \log x$

C. $y = kx$

D. $\log y = kx$

Answer: C

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17. P is the amount of certain substanc left in after time t. If the rate of evaporation of the substance is proportional to the amount remaining, then

A. $P = ce^{kt}$

B. $P = ce^{-kt}$

C. $P = ckt$

D. $Pt = c$

Answer: B

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

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

Answer: D

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19. If the function $f(x) = \frac{1}{12}$ for $a < x < b$, represents a probability density function of a continuous random variable X, then which of the following cannot be the value of a and b?

A. 0 and 12

B. 5 and 17

C. 7 and 19

D. 16 and 24

Answer: D

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20. Which one of the following is incorrect?

For any two propostitions p and q, we have

A. $\neg(p \vee q) \equiv \neg p \wedge \neg q$

B. $\neg(p \wedge q) \equiv \neg p \vee \neg q$

C. $\neg(p \vee q) \equiv \neg p \vee \neg q$

D. $\neg(\neg p) \equiv p$

Answer: C

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Part Ii

1. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{bmatrix}$ by reducing it to a row-echelon form.

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2. If z = x + iy, find in rectangular form.

Im (3z + $4\bar{z}$ - 4i)

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3. Find the value of $\cos^{-1}\left(\frac{1}{2}\right) + \sin^{-1}(-1)$

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4. Find the equation of the circles whose radius is 4 and whish is concentric with the circle $x^2 + y^2 + 2x - 6y = 0$

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5. Find the direction cosines of the normal to the plane 12x + 3y - 4z = 65. Also, find the non-parametric form of vector equation of a plane and the length of the perpendicular to the plane from the origin.

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6. Evaluate $\lim_{x \to \infty} \frac{2x^2 - 3}{x^5 - 5x + 3}$

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7. In each of the following cases , determine whether the following function is homogeneous or not. If it is so , find the degree. (i) $f(x, y) = x^2y + 6x^3 + 7$ (ii) $h(x, y) = \dfrac{6x^2y^3 - \pi y^5 + 9x^4y}{2020x^2 + 2019y^2}$

(iii) $g(x, y, z) = \dfrac{\sqrt{3x^2 + 5y^2 + z^2}}{4x + 7y}$ (iv) $U(x, y, z) = xy + \sin\left(\dfrac{y^2 - 2z^2}{xy}\right)$

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8. Suppose that f(x) given below represents a probability mass function

x	1	2	3	4	5	6
$f(x)$	c^2	$2c^2$	$3c^2$	$4c^2$	c	$2c$

Find (i) the value of c (ii) Mean and variance.

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9. Verify the

Closure property

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10. Determine the number of positive and negative roots of the equation $x^9 - 5x^8 - 14x^7 = 0$.

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Part Iii

1. Four men and 4 women can finish a piece of work jointly in 3 days while 2 men and 5 women can finish the same work jointly in 4 days. Find the time taken by one man alone

and that of one woman alone to finish the same work by using matrix inversion method.

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2. If z = 2 - 2i, find the rotation of z by θ radians in the counter clockwise direction about the origin when

$\theta = \frac{\pi}{3}$

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3. Find the equation of th tangen to the parabola $y^2 = 16x$ perpendicular to $2x + 2y + 3 = 0$

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4. Find the magnidude and direction cosines of the torque of a force represented by $3\hat{i} + 4\hat{j} - 5\hat{k}$ about the point with position vector $2\hat{i} - 3\hat{j} + 4\hat{k}$ acting through a point whose position vector is $4\hat{i} + 2\hat{j} - 3\hat{k}$.

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5. Evaluate $\lim_{x \to 1} x^{\frac{1}{x-1}}$

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6. Prove that $\int_0^{\frac{\pi}{4}} \log(1+\tan x)dx = \frac{\pi}{8}\log 2$

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7. Solve the differential equations :

$$\frac{dy}{dx} = e^{x+y} + x^3 e^y$$

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8. A lottery with 600 tickets gives one prize of Rs. 200, four prizes of Rs. 100, and six prizes of Rs. 50. If the ticket costs is Rs. 2, find the expected winning amount of a ticket.

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9. Write the

Conditional statement

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Part Iv

1. In vestigate the values of λ and μ the system of linear equations $2x+3y+5z=9, 7x+3y-5z=8, 2x+3y+\lambda z=\mu$, have

(i) no solution

(ii) a unique solution

(iii) an infinite number of solutions.

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2. If z =x + iy is complex number such that Im $\left(\frac{2z+1}{iz+1}\right)$ = 0, show that the locus of z is $2x^2 + 2y^2 + x - 2y = 0$.

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3. Prove that the values of $4\sqrt{-1}$ are $\pm\frac{1}{\sqrt{2}}(1\pm i)$.

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4. On lighting a rocket cracker it gets projected in a parabolic path and reaches a maximum height of 4m when it is 6 m away from the point of projection. Finally it reaches the ground 12 m away from the starting point. Find the angle of projection.

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5. The overall percentage of passes in a certain examination is 80 . If six candidates appear in the examination what is the probability that at least five pass the examination .

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6. For each of the functions find the f_x, f_y, and show that $f_{xy} = f_{yx}$.

$f(x, y) = \cos\left(x^2 - 3xy\right)$

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7. A ladder 17 metre long is leaning against the wall. The base of the ladder is pulled away from the wall at a rate of 5m/s. When the base of the ladder is 8 metres from the wall.

How fast is the top of the ladder moving down the wall?

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