



## MATHS

### BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

### SAMPLE PAPER- 10 (UNSOLVED)

Part I | Choose The Correct Answer Answer All The Questions

1. If  $A$  is a non-singular matrix such that

$$A^{-1} = \begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}, \text{ then } (A^T)^{-1} =$$

A.  $\begin{bmatrix} 5 & 3 \\ 2 & 1 \end{bmatrix}$

B.  $\begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$

C.  $\begin{bmatrix} -1 & -3 \\ 2 & 5 \end{bmatrix}$

D.  $\begin{bmatrix} 5 & -2 \\ 3 & -2 \end{bmatrix}$

**Answer: D**



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2. If  $\Delta \neq 0$  then the system is .....

- A. Consistent and has unique solution
- B. Consistent and has infinitely many solutions
- C. Inconsistent
- D. Either consistent or inconsistent

**Answer: A**



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3. The solution of the equation  $|z| - z = 1 + 2i$  is

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

B.  $-\frac{3}{2} + 2i$

C.  $2 - \frac{3}{2}i$

D.  $2 + \frac{3}{2}i$

**Answer: A**



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4. The value of  $e^{i\theta} + e^{-i\theta}$  is .....

A.  $2 \cos \theta$

B.  $\cos \theta$

C.  $2 \sin \theta$

D.  $\sin \theta$

**Answer: A**



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5. The polynomial  $x^3 - kx^2 + 9x$  has three real zeros if and only if,  $k$  satisfies

A.  $|k| \leq 6$

B.  $k = 0$

C.  $|k| > 6$

D.  $|k| \geq 6$

**Answer: D**

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6. The domain of the function defined by

$$f(x) = \sin^{-1} \sqrt{x-1} \text{ is}$$

A.  $[1, 2]$

B.  $[-1, 1]$

C.  $[0, 1]$

D.  $[-1, 0]$

**Answer: A**

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7.  $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right)$  is equal to

A.  $\frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)$

B.  $\frac{1}{2}\sin^{-1}\left(\frac{3}{5}\right)$

C.  $\frac{1}{2}\tan^{-1}\left(\frac{3}{5}\right)$

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

**Answer: D**

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8. The equation of the latus rectum of  $y^2 = 4x$  is.....

A.  $x = 1$

B.  $y = 1$

C.  $x = 4$

D.  $y = -1$

**Answer: A**



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9. 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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**10.** If the length of the perpendicular from the origin to the \_\_\_\_\_ plane

$2x + 3y + \lambda z = 1, \lambda > 0$  is  $\frac{1}{5}$  then the value of  $\lambda$  is

A.  $2\sqrt{3}$

B.  $3\sqrt{2}$

C. 0



D. 1

**Answer: A**

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11. The tangent to the curve  $y^2 - xy + 9 = 0$  is vertical when .....

A.  $y = 0$

B.  $y = \pm \sqrt{3}$

C.  $y = \frac{1}{2}$

D.  $y = \pm \sqrt{3}$

**Answer: B**

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12. The volume of a sphere is increasing in volume at the rate of  $3 \pm \text{cm}^3 / \text{sec}$ . The rate of change of its radius when radius is  $\frac{1}{2}$  cm .....

A. 3 cm/s

B. 2 cm/s

C. 1 cm/s

D.  $\frac{1}{2}$  cm/s

**Answer: A**

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13. If we measure the side of a cube to be 4 cm with an error of 0.1 cm, then the error in our calculation of the volume is

- A. 0.4 cu.cm
- B. 0.45 cu.cm
- C. 2 cu.cm
- D. 4.8 cu.cm

**Answer: D**

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14. If  $v(x, y) = \log(e^x + e^y)$ , then  $\frac{\partial v}{\partial x} + \frac{\partial v}{\partial y}$  is equal to

A.  $e^x + e^y$

B.  $\frac{1}{e^x + e^y}$

C. 2

D. 1

**Answer: D**



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15. The value of  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^2 x \cos x dx$  is

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

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

C. 0

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

**Answer: D**

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16. The general solution of the differential equation

$$\log\left(\frac{dy}{dx}\right) = x + y \text{ is}$$

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

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

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

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

**Answer: B**

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17. The order and degree of the differential equation

$$\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{\frac{1}{3}} + x^{\frac{1}{4}} = 0 \text{ are respectively.}$$

- A. 2, 3
- B. 3, 3,
- C. 2, 6
- D. 2, 4

**Answer: A**

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18. If  $X$  is a binomial random variable with expected value 6 and variance 2.4, then  $P(X=5)$  is

A.  $\binom{10}{5} \left(\frac{3}{5}\right)^6 \left(\frac{2}{5}\right)^4$

B.  $\binom{10}{5} \left(\frac{3}{5}\right)^5$

C.  $\binom{10}{5} \left(\frac{3}{5}\right)^4 \left(\frac{2}{5}\right)^6$

D.  $\binom{10}{5} \left(\frac{3}{5}\right)^5 \left(\frac{2}{5}\right)^5$

**Answer: D**



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19. A random variable  $X$  has binominal distribution with  $n = 25$  and  $p = 0.8$  then standard deviation of  $X$  is

A. 6

B. 4

C. 3

D. 2

**Answer: D**



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20. If  $a * b = \sqrt{a^2 + b^2}$  on the real numbers then  $*$  is

A. commutative but not associative

B. associative but not commutative

C. both commutative and associative



D. neither commutative nor associative

**Answer: C**

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**Part II Answer Any Seven Questions Question No 30 Is Compulsory**

1. Evaluate the following if  $z = 5 - 2i$  and  $w = -1 + 3i$

$zw$

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2. Find a polynomial equation of minimum degree with rational coefficients, having  $2i+3$  as a root.



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3. Using the Rolle's theorem, determine the values of  $x$  at which the tangent is parallel to the  $x$ -axis for the following functions :

$$f(x) = x^2 - x, x \in [0, 1]$$



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4. 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)

$$h(x, y) = \frac{6x^2y^3 - \pi y^5 + 9x^4y}{2020x^2 + 2019y^2}$$

(iii)  $g(x, y, z) = \frac{\sqrt{3x^2 + 5y^2 + z^2}}{4x + 7y}$  (iv)

$$U(x, y, z) = xy + \sin\left(\frac{y^2 - 2z^2}{xy}\right)$$

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5. Find, by integration, the volume of the solid generated by revolving about the x-axis, the region enclosed by  $y = e^{-2x}$ ,  $y = 0$ ,  $x = 0$  and  $x = 1$

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6. Compute  $P(X = K)$  for the binomial distribution

$B(n,p)$  where

$$n = 10, p = \frac{1}{5} \quad k=4$$



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7. Let  $A = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{pmatrix}, B = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix}$

$C = \begin{pmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix}$  by any three boolean matrices of the

same type. Find (i)  $A \vee B$ , (ii)  $A \wedge B$ , (iii)  $(A \vee A) \wedge C$ , (iv)

$(A \wedge B) \vee C$ .



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8. The slope of the tangent to the curve at any point is the reciprocal of four times the ordinate at that point. The curve passes through  $(2, 5)$ . Find the equation of the curve.



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Part Iii Iii Answer Any Seven Questions Question No 40 Is Compulsory

1. A man is appointed in a job with a monthly salary of certain amount and a fixed amount of annual increment. If his salary was Rs 19,800 per month at the end of the first month after 3 years of service and Rs 23,400 per month at the end of the first month after 9 years of service find his

starting salary and his annual increment. (Use matrix inversion method to solve the problem.)

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2. If the equation  $x^2 + px + q = 0$  and  $x^2 + p'x + q' = 0$  have common roots, show that it must be equal to  $\frac{pq' - p'q}{q - q'}$  or  $\frac{q - q'}{p' - p}$ .

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

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4. A camera is accidentally knocked off an edge of a cliff 400 ft high. The camera falls a distance of  $s = 16t^2$  in  $t$  seconds.

How long does the camera fall before it hits the ground?

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5. If the radius of a sphere, is measured as 7m with an error of 0.02 m then find the approximate error in calculating its volume .

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6. The volume of the solid that results when the region enclosed by  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  is revolved about the minor axis is :

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7. Verify that the function  $y = e^{-3x}$  is solution of the differential equation  $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$

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8. The time to failure in thousands of hours of an electronic equipment used in a manufactured computer has the density function



$$f(x) = \begin{cases} 3e^{-3x} & x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

Find the expected life of this electronic equipment.

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9. Let  $A = \{a + \sqrt{5}b : a, b \in \mathbb{Z}\}$ . Check whether the usual multiplication is a binary operation on  $A$ .

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10. If  $\frac{z + 3}{z - 5i} = \frac{1 + 4i}{2}$  find the complex number  $z$ .

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1. A manufacturer wants to design an open box having a square base and a surface area of 108 sq. cm. Determine the dimensions of the box for the maximum volume.

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2. Solve  $\left(1 + 2e^{x/y}\right)dx + 2e^{x/y}\left(1 - \frac{x}{y}\right)dy = 0$

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

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4. Cross section of a Nuclear cooling tower is in the shape of a hyperbola with equation  $\frac{x^2}{30^2} - \frac{y^2}{44^2} = 1$ . The tower is 150 m tall and the distance from the top of the tower to the centre of the hyperbola is half the distance from the base of the tower to the centre of the hyperbola. Find the diameter of the top and base of the tower.



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5. The cumulative distribution function of a discrete random variable is given by

$$F(x) = \begin{cases} 0 & \text{for } -\infty < x < 0 \\ \frac{1}{2} & \text{for } 0 \leq x < 1 \\ \frac{3}{5} & \text{for } 1 \leq x < 2 \\ \frac{4}{5} & \text{for } 2 \leq x < 3 \\ \frac{9}{10} & \text{for } 3 \leq x < 4 \\ 1 & \text{for } 4 \leq x < \infty \end{cases}$$

Find (i) the probability mass function (ii)  $P(X < 3)$  and (iii)  $P(X \geq 2)$ .

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6. Prove that :  $\cos [\tan^{-1} \{ \sin(\cot^{-1} x) \}] = \sqrt{\frac{x^2 + 1}{x^2 + 2}}$

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7. Evaluate  $\int_0^{\frac{\pi}{2}} \frac{\sin x}{4 + \cos^2 x} dx$ .





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