MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER - 19 (UNSOLVED)

Part I I Choose The Correct Answer Answer All The Questions

1. If A = $\begin{bmatrix} 3 & 1 & -1 \\ 2 & -2 & 0 \\ 1 & 2 & -1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$

then the value of a_{23} is

A. 0

B. -2

C. -3

D. -1

Answer: D

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2. If z = x + iy is a complex number such that |z + 2| = |z - 2|, then the locus of z is

A. real axis

B. imaginary axis

C. ellipse

D. circle

Answer: B

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3. The values of $\overset{=}{z} + \overset{-}{z}$ is ..... .

A. $2Re(z)$

B. $Re(z)$

C. $Im(z)$

D. $2Im(z)$

Answer: A

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

A. one negative and two imaginary zeros

B. one positive and two imaginary zeros

C. three real zeros

D. no zeros

Answer: A

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5. $\sin^{-1}\left[\tan\frac{\pi}{4}\right] - \sin^{-1}\left[\sqrt{\frac{3}{x}}\right] = \frac{\pi}{6}$. Then x is a root of the equation

A. $x^2 - x - 6 = 0$

B. $x^2 - x - 12 = 0$

C. $x^2 + x - 12 = 0$

D. $x^2 + x - 6 = 0$

Answer: B

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6. $\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{3}\right)=$ ..... .

A. $\sin^{-1}\frac{1}{\sqrt{2}}$

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

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

D. $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

Answer: A

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7. Consider an ellispe whose centre is of the origin and its major axis is along x-axis. If its eccentiricity is $\frac{3}{5}$ and the distance between its foci is 6, then the area of the quadrilateral insricbed in the ellipse with diagonals as major and minor axis of the ellipse is

A. 8

B. 32

C. 80

D. 40

Answer: D

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8. The eccentricity of ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ is .....

.

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

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

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

D. $\frac{4}{5}$

Answer: D

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9. If the distance of the point $(1, 1, 1)$ from the origin is half of its distance from the plane x + y + z + k = 0, then the value of k are

A. ± 3

B. ± 6

C. $-3, 9$

D. $3, \ -9$

Answer: D

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10. The position of a particle moving along a horizontal line of any time t is given by $s(t) = 3t^2 - 2t - 8$. The time at which the particle is at rest is ..... .

A. $t = 0$

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

C. $t = 1$

D. $t = 3$

Answer: B

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11. The function $f(x) = x^2$ has ..... .

A. a maximum value at $x = 0$

B. minimum value at $x = 0$

C. finite no. of maximum values

D. infinite no. of maximum values

Answer: B

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12. The percentage error of fifth root of 31 is approximately how many times the percentage error

in 31?

A. $\frac{1}{31}$

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

C. 5

D. 31

Answer: B

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13. The differential of y if $y = x^5$ is, ...

A. $5x^4$

B. $5x^4dx$

C. $5x^5dx$

D. $5x^5$

Answer: B

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14. The value of $\int_0^1 \left(\sin^{-1}x\right)^2 dx$ is

A. $\frac{\pi^2}{4} - 1$

B. $\frac{\pi^2}{4} + 2$

C. $\frac{\pi^2}{4} + 1$

D. $\frac{\pi^2}{4} - 2$

Answer: D

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15. If $f(x)$ is an odd function then $\int_{-a}^{a} f(x)dx$ is ..... .

A. $2\int_{0}^{a} f(x)dx$

B. $\int_{0}^{a} f(x)dx$

C. 0

D. $\int_{0}^{a} f(a-x)dx$

Answer: C

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16. 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. $x\phi\left(\frac{y}{x}\right) = k$

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

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

D. $\phi\left(\frac{y}{x}\right) = ky$

Answer: B

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17. The number of arbitrary constants in the particular solution of a differential equation of third order is

A. 3

B. 2

C. 1

D. 0

Answer: D

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18. 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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19. If $f(x) = \begin{cases} 2x & 0 \leq x \leq a \\ 0 & \text{otherwise} \end{cases}$ is a probability density function of a random variable, then the value of a is

A. 1

B. 2

C. 3

D. 4

Answer: A

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20. If a compound statement involves 3 simple statements, then the number of rows in the truth table is

A. 9

B. 8

C. 6

D. 3

Answer: B

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Part Ii Ii Answer Any Seven Questions Questions No 30 Is Compulsory

1. Test for consistency and if possible solve the following system of equations by rank method.

2x+2y+z=5,x-y+z=1,3x+y+2z=4

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2. Given $z_1 = 4 - 7i$ and $z_2 = 5 + 6i$ find the additive and multiplicative inverse of $z_1 + z_2$ and $z_1 - z_2$.

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3. Find the maximum possible number of real roots of the equation. $x^5 - 6x^2 - 4x + 5 = 0$.

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4. Find the value of $\sin^{-1}\left(\frac{5\pi}{4}\right)$

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5. 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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6. Evaluate: $\int_0^{\pi/4} \frac{\sin^3 x}{\cos^5 x}\, dx$

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7. For the distribution function given by $F(x) = \begin{cases} 0, & x < 0 \\ x^2, & 0 \le x \le 1 \\ 1, & x > 1 \end{cases}$. Find the density function.

Also evaluate (i) $P(0.5 < x < 0.75)$ (ii) $P(x \le 0.5)$

(iii) $P(X > 0.75)$

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8. Verify the

Closure property

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9. A stone is dropped into a pond causing ripples in the form of concentric circles. The radius r of the outer ripple is increasing at a constant rate at 2 cm per second. When the radius is 5 cm find the rate of changing of the total area of the disturbed water?

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

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

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2. Find the cube roots of unity.

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3. Solve the equation $2x^3 + 11x^2 - 9x - 18 = 0$

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4. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \pi$, then prove that

$$x^4 + y^4 + z^4 + 4x^2y^2z^2 = 2\left(x^2y^2 + y^2z^2 + z^2x^2\right)$$

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5. Find the equation of the hyperbola in the cases given below : passing through $(5, -2)$ and length of the transverse axis along x axis and of length 8 units.

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6. Show that the straight lines $x+1=2y=-12z$ and $x=y+2=6z-6$ are skew and hence find the shortest distance between them.

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7. The region enclosed between the graphs of $y=x$ and $y=x^2$ is denoted by R, Find the volume generated when R is rotated through 360° about x - axis.

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8. Solve : $\frac{dy}{dx} = (3x + y + 4)^2$

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9. A commuter train arrives punctually at a station every half hour. Each morning, a student leaves his house to the train station. Let x denote the amount of time, in minutes, that the student waits for the train from the time he reaches the train station. It is known that the pdf of X is $f(x) = \begin{cases} \frac{1}{30} & 0 < x < 30 \\ 0 & \text{elsewhere} \end{cases}$. Obtain interpret the expected value of the random variable X.

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10. Show that $p \to q$ and $q \to p$ are not equivalent.

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Part Iv Iv Answer All The Questions

1. If the system of equtions $px + by + cz = 0, ax + qy + cz = 0, ax + by + rz = 0$ has a non - trivial solution and $p \neq q, q \neq , r \neq c,$ prove that $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} = 2.$

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2. Two fair coins are tossed simultaneously (equivalent to a fair coin is tossed twice). Find the probability mass function for number of heads occurred.

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3. 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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4. Find the value of $\tan\left(2\tan^{-1}\left(\frac{1}{5}\right)-\frac{\pi}{4}\right)$

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5. Parabolic cable of a 60m portion of the roadbed of a suspension bridge are positioned as shown below. Vertical Cables are to be spaced every 6m along this portion of the roadbed. Calculate the lengths of first two of these vertical cables from the vertex.

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6. Evaluate the following limits, if necessary use l' Hopital Rule :

$$\lim_{x \to 0^+} (\cos x)^{\frac{1}{x^2}}$$

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7. A family of 3 people went out for dinner in a restaurant. The cost of two dosai, three idlies and two vadais is Rs 150. The cost of the two dosai, two idlies and four vadais is Rs 200. The cost of five dosai, four idlies and two vadais is Rs 250. The family has Rs 350 in hand and they ate 3 dosai and six idlies and six

vadais. Will they be able to manage to pay the bill within the amount they had?

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8. Solve : $12x^4 - 56x^3 + 89x^2 - 56x + 12 = 0$

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9. Evaluate $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1 + a^x} dx$

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10. Find the equation of the two tangents from the point (1,2) to the hyperbola $2x^2 - 3y^2 = 6$

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11. $dx + xdy = e^{-y} \sec^2 ydy$

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12. Solve the equation $z^2 + 27 = 0$

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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. Verify whether the following compound propositions are tautologies or contradictions or contingency

$((p\to q)\vee(q\to r))\to(p\to r)$

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