MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER - 6

Part I

1. If $|adj(adjA)| = |A|^9$ square matrix A is

A. 3

B. 4

C. 2

D. 5

Answer:

2. If $|z_1| = 1$, $|z_2| = 2$, $|z_3| = 3$ and $|9z_1z_2 + 4z_1z_3 + z_2z_3 = 12|$, then the value of $|z_1 + z_2 + z_3|$ is

A. 1

B. 2

C. 3

D. 4

Answer:

3. The value of $\left(\dfrac{1 + \sqrt{3}i}{1 - \sqrt{3}i} \right)$ is ....

A. $cis \dfrac{2\pi}{3}$

B. $cis \dfrac{4\pi}{3}$

C. $- cis \dfrac{2\pi}{3}$

D. $- cis \dfrac{4\pi}{3}$

Answer:

4. If

$$\cot^{-1}\left(\sqrt{\sin\alpha}\right) + \tan^{-1}\left(\sqrt{\sin\alpha}\right) = u, \text{ then } \cos 2u \text{ is equal to}$$

A. $\tan^2\alpha$

B. 0

C. -1

D. $\tan 2\alpha$

Answer:

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5. If $\cot^{-1}x = \dfrac{2\pi}{5}$ for some $x \in R$, the value of $\tan^{-1}x$

is ....

A. $-\dfrac{\pi}{10}$

B. $\dfrac{\pi}{5}$

C. $\dfrac{\pi}{10}$

D. $-\dfrac{\pi}{5}$

Answer:

6. The radius of the circle passing through the point (6,-2) two of whose diameter are x + y = 6 and x + 2y = 4 is ....

A. 10

B. $2\sqrt{5}$

C. 6

D. 4

Answer:

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7. The length of the L.R. of $x^2 = -4y$ is ....

A. 1

B. 2

C. 3

D. 4

Answer:

8. Distance from the origin to the plane 3x - 6y + 2z + 7 = 0

is

A. 0

B. 1

C. 2

D. 3

Answer:

9. The distance from the origin to he plane $\vec{r}\left(2\hat{i} - \hat{j} + 5\hat{k}\right) = 7$ is ....

A. $\dfrac{7}{\sqrt{30}}$

B. $\dfrac{\sqrt{30}}{7}$

C. $\dfrac{30}{7}$

D. $\dfrac{7}{30}$

Answer:

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10. The number given by the Mean value theorem for the function $\dfrac{1}{x}$, $x \in [1, 9]$ is

A. 2

B. 2.5

C. 3

D. 3.5

Answer:

11. f is a differentiable function defined on an interval I with positive derivative . Then f is ....

A. increasing on I

B. decreasing on I

C. strictly increasing on I

D. strictly decreasing on I

Answer:

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12. 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:

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

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

B. 2xu

C. $x^2 u$

D. $y^2 u$

Answer:

14. The value of $\int_0^\infty e^{-3x} x^2 dx$ is

A. $\dfrac{7}{27}$

B. $\dfrac{5}{27}$

C. $\dfrac{4}{27}$

D. $\dfrac{2}{27}$

Answer:

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15. $\int_a^b f(x)dx =$

A. $\int_0^a f(x-a)dx$

B. $\int_0^a f(a-x)dx$

C. $\displaystyle\int_0^a f(2a - x)\,dx$

D. $\displaystyle\int_0^a f(x - 2a)\,dx$

Answer:

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16. The integrating factor of the differential equation

$\dfrac{dy}{dx} + P(x)y = Q(x)$ is x, then $P(x)$

A. x

B. $\dfrac{x^2}{2}$

C. $\dfrac{1}{x}$

D. $\dfrac{1}{x^2}$

Answer:

17. The order and degree of the differential equation

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

A. 2,3

B. 3,3

C. 2,6

D. 2,4

Answer:

18. Which of the following is a discrete random variable?

I. The number of cars crossing a particular signal in a day.

II. The number of customers in a queue to buy train tickets at a moment.

III. The time taken to complete a telephone call.

A. I and II

B. II only

C. III only

D. II and III

Answer:

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19. If p is true and q is false, then which of the following is not true?

    A. $p \rightarrow q$ is false

    B. $p \vee q$ is true

    C. $p \wedge q$ is false

    D. $p \leftrightarrow q$ is ture

Answer:

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20. The operation $*$ defined by $a * b = \dfrac{ab}{7}$ is not a binary operation on

A. $\mathbb{Q}^+$

B. $\mathbb{Z}$

C. $\mathbb{R}$

D. $\mathbb{C}$

Answer:

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Part Ii

1. Using elementary transformations find the inverse of the following matrix $\begin{bmatrix} 4 & 7 \\ 3 & 6 \end{bmatrix}$

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2. If $z_1 = 1 - 3i$, $z_2 = -4i$ and $z_3 = 5$, show that

$$(z_1 + z_2) + z_3 = z_1 + (z_2 + z_3)$$

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3. Find a polynomial equation of minimum degree with rational coefficients, having $2 + \sqrt{3}I$ as a root.

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4. Evaluate : $\lim\limits_{x \to \infty} \left(\dfrac{x^2 + 17x + 29}{x^4} \right)$

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5. Let

$$g(x, y) = 2y + x^2, \ x = 2r - s, \ y = r^2 + 2s, \ r, s \in \mathbb{R}.$$

Find $\dfrac{\partial g}{\partial r}, \ \dfrac{\partial g}{\partial s}$

6. Evaluate : $\displaystyle\int_0^{\frac{\pi}{2}} \left(\sin^2 x + \cos^4 x \right) dx$

7. Find the differential equation corresponding to the family of curves represented by the equation $y = Ae^{8x} + Be^{-8x}$, where A and B are arbitrary constants.

8. If F $(x) = \dfrac{1}{\pi}\left(\dfrac{\pi}{2} + \tan^{-1} x\right) - \infty < x < \infty$ is a a

distribution function of a continuous variable X find P

$(0 \le x \le 1)$

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

10.   Show   that   the   lines

$$\dfrac{x-1}{4} = \dfrac{2-y}{6} = \dfrac{z-4}{12} \text{ and } \dfrac{x-3}{-2} = \dfrac{y-3}{3} = \dfrac{5-z}{6}$$

are parallel.

Part Iii

1. Using elementary transformations find the inverse of the matrix $\begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$

2. Find the square roots of - 15 - 8i

3. Find the sum of the squares of the roots of

$$ax^4 + bx^3 + cx^2 + dx + e = 0, a \neq 0.$$

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4. For what value of x , the inequality

$$\frac{\pi}{2} < \cos^{-1}(3x - 1) < \pi \text{ holds ?}$$

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5. Find the foot of the perpendicular drawn from the point $(5, 4, 2)$ to the line $\dfrac{x+1}{2} = \dfrac{y-3}{3} = \dfrac{z-1}{-1}$. Also, find the eqution of the perpendicular.

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6. Evaluate $\int_0^\infty \dfrac{x^n}{n^x} dx$, where n is a positive integer.

7. The engine of a motor boat moving at 10 m/s is shut off. Given that the restardation at any subsequent time (aftere shutting off the engine) equal to the velocity at that time. Find the velocity after 2 seconds of switching off the engine.

8. The probability that Mr. Q hits a target at any trial is $\frac{1}{4}$. Suppose he tries at the target 10 times. Find the probability that he hits the target (i) exactly 4 times (ii) at least one time.

9. Consider the binary operation * defined on the set $A = \{a, b, c, d\}$ by the following table.

*	a	b	c	d
a	a	c	b	d
b	d	a	b	c
c	c	d	a	a
d	d	b	a	c

It is commutative and associative ?

10. Evaluate the following limit, if necessary use l' Hopital Rule $\lim\limits_{x \to \infty} \left(1 + \dfrac{1}{x}\right)^x$

Part Iv

1. Find the inverse of $A = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 1 \\ 2 & 1 & 2 \end{bmatrix}$ by Gauss - Jordan method.

2. Find the point of intersection of the lines
$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \text{ and } \frac{x-4}{5} = \frac{y-1}{2} = z.$$

3. Suppose z_1, z_2 and z_3 are the vertices of an equilateral triangle inscribed in the circle |z| = 2. If $z_1 = 1 + i\sqrt{3}$ then find z_2 and z_3.

4. If $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$, show that $A^2 - 3A - 7I_2 = O_2$ Hence find A^{-1}.

5. Solve the equation $3x^3 - 16x^2 + 23x - 6 = 0$ if the product of two roots is 1.

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6. The mean and variance of a binomial variate x are respectively 2 and 1.5 then P(X=0) is

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7. Find the value of

$$\cos\left[\sin^{-1}\left(\frac{4}{5}\right) - \tan^{-1}\left(\frac{3}{4}\right)\right]$$
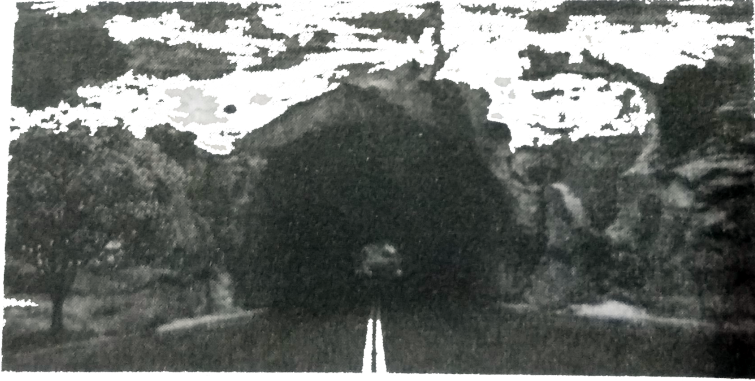
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8. Find , by integration , the volume of the solid generated by revolving about y - axis the region bounded between the curve $y = \frac{3}{4}\sqrt{x^2 - 16}, \, x \geq 4$, the y - axis and the lines y = 1 and y = 6.

9. A semielliptical archway over a one-way road has height of 3m and a width of 12m. The truck has a width of 3m and a height of 2.7m. Will the truck clear the opening of the

archway?

10. If f(x,y) $= \dfrac{1}{\sqrt{x^2 + y^2}}$ then show that

$$x\frac{\partial f}{\partial x} + y\frac{\partial f}{\partial y} = -f$$

11. Derive the equation of the plane in the intercept form.

12. Let A be Q/{1}. Define * on A by x * y=x+y-xy. Is * binary on

A? If so, examine the existence of identity & inverse

properties for the operation * on A.

13. Find the angle between the rectangular hyperboloa xy =

2 and the parabola $x^2 + 4y = 0$.

14. A pot of boiling water at $100°C$ is removed from a stove at time t = 0 and left to cool in the kitchen. After 5 minutes, the water temperature has decreased to $80°C$, and another 5 minutes later it has dropped to $65°C$. Determine the temperature of the kitchen.

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