MATHS

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MODEL QUESTION PAPER -1

Part I

1. If A $\begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}$ then rank of AA^T is :

A. 3

B. 2

C. 1

D. 9

Answer:

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2. If A $\begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix}$ then (Adj A) . A is :

A. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

B. $\begin{pmatrix} 10 & 0 \\ 0 & 10 \end{pmatrix}$

C. $\begin{pmatrix} \frac{1}{10} & 0 \\ 0 & \frac{1}{10} \end{pmatrix}$

D. $\begin{pmatrix} -10 & 0 \\ 0 & -10 \end{pmatrix}$

Answer:

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3. Simplify : $\left(\frac{1 + \cos\theta - i\sin\theta}{1 + \cos\theta + i\sin\theta} \right)^5$

A. $\cos 5\theta$

B. $\cos 5\theta - i \sin 5\theta$

C. $\sin 5\theta + i \cos 5\theta$

D. $\sin 5\theta - i \cos 5\theta$

Answer:

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4. Find the value of $\left(\frac{-1 - i\sqrt{3}}{2} \right)^{21}$

A. 1

B. -1

C. ω

D. ω^2

Answer:

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5. The curve $y = ax^3 + bx^2 + cx + d$ has a point of inflexion at x=1 , then :

A. $a + b = 0$

B. $a + 3b = 0$

C. $3a + b = 0$

D. $3a + b = 1$

Answer:

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6. The percentage error in the 10^{th} root of 38 is approximately .....

Times the percentage error in 38.

A. $\frac{1}{38}$

B. $\frac{1}{10}$

C. 10

D. 38

Answer:

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7. The length of the latus rectum of an ellipse in $\frac{1}{3}$ of its major axis.

Its eccentricity is :

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

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

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

D. $\frac{1}{\sqrt{2}}$

Answer:

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8. The focus of the parabola $x^2 - 2x + 8y + 17 = 0$ is :

A. (0,-2)

B. (0,2)

C. (2,0)

D. (-2,0)

Answer:

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9. The volume of the parallelepiped whose edges are represented by $-12\hat{i}+\lambda\hat{k}, 3\hat{j}-\hat{k}, 2\hat{I}+\hat{j}-15\hat{k}$ is 546 cubic units. Find the value of λ

A. -2

B. -3

C. 3

D. 2

Answer:

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10. The equation of the plane through the point whose position vecot ris $2\hat{I}-\hat{j}+\hat{k}$ and perpendicular to the vector is

$4\hat{i} + 2\hat{j} - 3\hat{k}$ is $4x + 2y - 3z = k$ then k is :

A. 5

B. 4

C. 3

D. 2

Answer:

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11. Using Rolle's theorrem find c if $f(x) = (x - a)(b - x), a \leq x \leq ba \neq b$

A. $2a + 2b$

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

C. $\frac{a + b}{2}$

D. $\frac{a-b}{2}$

Answer:

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12. Evaluate : $\lim_{x \to 0} \frac{\sin x}{x}$

A. ∞

B. -1

C. 0

D. 1

Answer:

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13. If $z = \log \frac{x^2 + y^2}{x + y}$ then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ is :

A. 0

B. 1

C. 2

D. -1

Answer: b

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14. $\int_0^{\frac{\pi}{2}} \frac{\sin x dx}{1 + \cos^2 x}$ is

A. π

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

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

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

Answer:

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15. The area of the region bounded by the line $3x - 5y - 15 = 0, x = 1$ and $x = 4$ is :

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

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

C. $\frac{7}{2}$

D. $\frac{9}{2}$

Answer:

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16. If (m,n) are the order and degree of $\frac{d^2y}{dx^2} = \left[4\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{4}}$ then value of $(2m+n)$ is :

A. 8

B. 6

C. 4

D. 2

Answer:

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17. The solution of $\frac{dy}{dx} + \frac{y}{x} = \frac{y^2}{x^2}$ is :

A. $\frac{x}{y} + \log x = c$

B. $\frac{y}{x} + \log x = c$

C. $\frac{x}{y} - \log x = c$

D. $\frac{y}{x} - \log x = c$

Answer:

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18. A random variable x has the following distribution .

x	1	2	3	4
$f(x)$	k	$2k$	$4k$	$3k$

Then its mean is :

A. $\frac{17}{10}$

B. $\frac{27}{10}$

C. $\frac{19}{10}$

D. $\frac{29}{10}$

Answer:

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

A. 8

B. 6

C. 4

D. 2

Answer:

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20. The mean of a binomial distrution 5 and SD is 2, Then the value of n and p are :

A. $\left(\frac{4}{5}, 25\right)$

B. $\left(25, \frac{4}{5}\right)$

C. $\left(\frac{1}{5}, 25\right)$

D. $\left(25, \frac{1}{5}\right)$

Answer:

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Part Ii

1. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & -1 & 3 \\ 2 & 4 & 1 & -2 \\ 3 & 6 & 3 & -7 \end{bmatrix}$

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2. If (1 + i)(1 + 2i)(1 + 3i)....(1 + ni) = x + iy, then 2.5.10... $\left(1+n^2\right)$ is

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3. Find the equation of the parabola of the curve is open downwards vertex (2,0) and the distance between the latus rectum and directrix is 2.

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4. Show that for any three vectors $\vec{a}, \vec{b}$ and $\vec{c}\left[\vec{a}+\vec{b}, \vec{b}+\vec{c}, \vec{c}+\vec{a}\right]=2\left[\vec{a}, \vec{b}, \vec{c}\right]$.

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5. Using differentials find the value of $\sqrt{105}$.

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

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7. Solve $\frac{dy}{dx} + \frac{y}{x} = x^2$.

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8. A continuous random variable k follows the probability law

$$f(x) = \begin{cases} kx(1-x)^{10} & 0 < x < 1 \\ 0 & \text{otherwise} \end{cases} \quad \text{find} k.$$

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9. Show that $(p \wedge \neg q) \vee (\neg p \vee q)$ is a tautology.

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Part Iii

1. Solve $x + y + z = 4, x - y + z = 2, 2x + y - z = 1$ using Crammer's rule.

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2. Find the square root of $-8 - 6i$.

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3. Solve : $\frac{x}{x-1} + \frac{x+1}{x} = \frac{13}{6}$.

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4. Prove that the sum of the focal distance of any point on the ellipse is constant and is equal to the length of the major axis.

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5. Solve $\frac{dy}{dx} = \frac{2x + 3y - 1}{3x - 2y + 5}$

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Part Iv

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. Solve : $6x^4 - 35x^3 + 62x^2 - 35x + 6 = 0$

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3. If $x + iy = \frac{3}{2 + \cos\theta + i\sin\theta}$ prove that $x^2 + y^2 = 4x - 3$

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4. The arch of a bridge is the shape of a semi ellipse having a horizontal span of 40 m and 16 m highest the centre. How high is the arch, 10m from the right/ left of the centre.

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5. If $u = \tan^{-1}\left(\frac{x^4 + y^4}{x^2 - y^2}\right)$ show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u.$

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6. Find the area between the curve $y = x^2 - x - 2$, x axis and the lines $x = -2$ and $x = 4$.

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7. A sphere is made of ice having radius 10 cm. Its radius decreases from 10 cm to 9.8 cm. Find approximations for the following:

(i) change in the volume

(ii) change in the surface area

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8. A sphere is made of ice having radius 10 cm. Its radius decreases from 10 cm to 9.8 cm. Find approximations for the following:

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9. If a discrete random variable can take only the values 0,1,2,3, the probability mass function is given by

$$f(x) = \begin{cases} k\left(x^2 + x + 1\right), & \text{x=0,1,2,3} \\ 0, & \text{otherwise} \end{cases}$$ Find K

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10. If a discrete random variable can take only the values 0,1,2,3, the probability mass function is given by

$f(x) = \begin{cases} k(x^2 + x + 1), & \text{x=0,1,2,3} \\ 0, & \text{otherwise} \end{cases}$ Find cumulative distribution function

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11. If a discrete random variable can take only the values 0,1,2,3, the probability mass function is given by $f(x) = \begin{cases} k(x^2 + x + 1), & \text{x=0,1,2,3} \\ 0, & \text{otherwise} \end{cases}$ Find K

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12. If a discrete random variable can take only the values 0,1,2,3, the probability mass function is given by $f(x) = \begin{cases} k(x^2 + x + 1), & \text{x=0,1,2,3} \\ 0, & \text{otherwise} \end{cases}$ Find Mean of the distribution .

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13. Let S=Q-(-1) and is defined in S as $a * b = a + b - ab$ for all $a, b, \in G$. Verify Closure.

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14. Let S=Q-(-1) and is defined in S as $a * b = a + b - ab$ for all $a, b, \in G$. Verify COmmutativity.

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15. Let S=Q-(-1) and is defined in S as $a * b = a + b - ab$ for all $a, b, \in G$. Verify Associativity.

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16. Let S=Q-(1) and is defined in S as $a * b = a + b - ab$ for all $a, b, \in G$. Verify existence of identity .

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17. Let S=Q-(-1) and is defined in S as $a * b = a + b - ab$ for all $a, b, \in G$. Verify Inverse in S.

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18. At what points on the curve $x^3 - 12x + 18 = 0$ the tangent is parallel to X axis.

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19. At what points on the curve $x^2 + y^2 - 2x - 4y + 1 = 0$ the tangent is parallel to Y-axis.

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20. Show that the lines $\vec{r} = \hat{i} + \hat{j} + t\left(\hat{i} - \hat{j} + 3\hat{k}\right)$ and $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + s\left(\hat{i} + 2\hat{j} - \hat{k}\right)$ intersect . Find the point of intersection.

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