MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER -08 (UNSOLVED)

Part I Choose The Correct Answer

1. If A is a 3×3 non -singular matrix such that $\mathrm{AA}^T = A^T A \text{and} B = A^{-1} A^T, \text{then} BB^T$ =

A. A

B. B

C. I_3

D. B^T

Answer: C

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2. The rank of the matrix $\begin{bmatrix} 7 & -1 \\ 2 & 1 \end{bmatrix}$ is ....

A. 9

B. 2

C. 1

D. 5

Answer: B

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3. The value of $\sum_{i=1}^{13}\left(n^n + i^{n-1}\right)$ is

A. $1+i$

B. i

C. 1

D. 0

Answer: A

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4. Which of the following is incorrect?

A. $\text{Re}(z) \leq |z|$

B. $\text{Im}(z) \leq |z|$

C. $z\bar{z} = |z|^2$

D. $\text{Re}(z) \geq |z|$

Answer: D

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5. According to the rational root theorem, which number is not possible rational zero of $4x^7 + 2x^4 - 10x^3 - 5$?

A. -1

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

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

D. 4

Answer: C

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

A. $\tan^2\alpha$

B. 0

C. -1

D. $\tan 2\alpha$

Answer: C

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7. The domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$ is

A. [1,2]

B. $[-1, 1]$

C. $[0, 1]$

D. $[-1, 0]$

Answer: A

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8. The area of quardrilateral formed with foci of the hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$ is

A. $4(a^2+b^2)$

B. $2(a^2+b^2)$

C. a^2+b^2

D. $\frac{1}{2}(a^2+b^2)$

Answer: B

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9. The directrix of the parabola $x^2 = -4y$ is ....

A. x=1

B. x=0

C. y=1

D. y=0

Answer: C

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10. If the line $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$ lies in the plane $x+3y-az+\beta=0$ then (

is

A. (-5,5)

B. (-6,7)

C. (5,-5)

D. (6,-7)

Answer: B

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11. If $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=\left(\vec{a}\times\vec{b}\right)\times\vec{c}$ for non coplanar $\vec{a}, \vec{b}, \vec{c}$

then......

A. $\vec{a}$ parallel to $\vec{b}$

B. $\overrightarrow{b}$ parallel to $\overrightarrow{c}$

C. $\overrightarrow{c}$ parallel to $\overrightarrow{a}$

D. $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$

Answer: C

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12. The maximum value of the product of two positive numbers, when their sum of the squares is 200, is

A. 100

B. $25\sqrt{7}$

C. 28

D. $24\sqrt{14}$

Answer: A

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13. If w(x,y,z) $=x^2(y-z)+y^2(z-x)+z^2(x-y)$, then $\frac{\partial w}{\partial x}+\frac{\partial w}{\partial y}+\frac{\partial w}{\partial z}$ is

A. $xy+yz+zx$

B. $x(y+z)$

C. $y(z+x)$

D. 0

Answer: D

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14. If $u(x, y)=x^2+3xy+y-2019$, then $\left(\frac{\partial u}{\partial x}\right)_{4 \quad -5}$ is equal to

A. -4

B. -3

C. -7

D. 13

Answer: C

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15. The volume of solid of revolution of the region bounded by $y^2 = x(a - x)$ about x-axis is

A. πa^3

B. $\frac{\pi a^3}{4}$

C. $\frac{\pi a^3}{5}$

D. $\frac{\pi a^3}{6}$

Answer: D

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16. If $\int_0^a f(x)dx + \int_0^a f(2a-x)dx =$

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

B. $2\int_0^a f(x)dx$

C. $\int_0^{2a} f(x)dx$

D. $\int_0^{2a} f(a-x)dx$

Answer: C

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17. The differential equation of the family of curves $y = Ae^x + be^{-x}$, where A and B are arbitrary constant is

A. $\frac{d^2y}{dx^2} + y = 0$

B. $\frac{d^2y}{dx^2} - y = 0$

C. $\frac{dy}{dx} + y = 0$

D. $(dy)(dx) - y = 0$

Answer: B

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18. The differential equation corresponding to $xy = c^2$ where c is an arbitrary constant is _______

A. $xy + x = 0$

B. $y = 0$

C. $xy' + y = 0$

D. $xy - x = 0$

Answer: C

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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. The proposition $p \wedge (\text{~}p \vee q)$ is

A. a tautology

B. a contrdiction

C. logically equivalent to $p \wedge q$

D. logically equivalent to $p \vee q$

Answer: C

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Part Ii

1. A 12 metre tell tree was broken into Two it was found that the height of the part which was left standing was the cube root of the length of the part that was cut away. Formulate this into a mathematical problem to find the height of the part which was cut away.

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2. Find the value of $\sin^{-1}\left(\sin\frac{5\pi}{9}\cos\frac{\pi}{9}+\cos\frac{5\pi}{9}\sin\frac{\pi}{9}\right)$

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3. Obtain the equation of the circles with radius 5 cm and touching x-axis at the origin in general form.

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4. Find the length of the perpendicular from the origin to the plane $\vec{r}.\left(3\vec{i}+4\vec{j}+12\vec{k}\right)=26$

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5. Evaluate $\lim_{x\to(\pi/2)}\frac{\log(\sin x)}{(\pi-2x)^2}$

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6. Evaluate: $\int_{-1}^{1} e^{-\lambda x}\left(1-x^2\right)$dx.

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

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8. Three fair coins are tossed simultaneously. Find the probability mass function for number of heads occurred.

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9. Construct the truth table for $(p \vee q) \vee \sim q$

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10. Show that $f(x, y) = \frac{x^2 - y^2}{y^2 + 1}$ is continous at every, $(x, y) \in R^2$.

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Part Iii

1. Form a polynomial equation with integer coefficients with $\sqrt{\frac{\sqrt{2}}{\sqrt{3}}}$ as a root.

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2. Find the equation of the tangents from the point (2,-3) to the parabola $y^2 = 4x$

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3. Find the vector and cartesian equations of the straight line passing through (-5, 2, 3) and (4, -3, 6).

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4. Find the points on the curve $y = x^3 - 6x^2 + x + 3$ where the normal is parallel to the line $x + y = 1729$

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5. Assuming $\log_{10} e = 0.4343$, find an approximate value of $\log_{10} 1003$.

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6. Evaluate the following :

$$\int_0^{\frac{\pi}{2}} \sin^2 x \cos^4 x dx$$

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7. Solve the differential equations :

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

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8. Using binomial distribution find the mean and variance of X for the following experiments

(i) A fair coin is tossed 100 times and X denote the number of heads .

(ii) A fair die is tossed 240 times and X denote the number of times that four appeared .

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9. 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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10. Sketch the graph of $y = \sin\left(\frac{1}{3}x\right)$ for $0 \leq x < 6\pi$.

Part Iv

1. A fish tank can be filled in 10 minutes using both pumps A and B simultaneously. However, pump B can pump water in or out at the same rate. If pump B is inadvertently run in reverse, then the tank will be filled in 30 minutes. How long would it take each pump to fill the tank by itself ? (Use Cramer's rule to solve the problem).

2. a. Let z_1, z_2 and z_3 be complex numbers such that $|z_1| = |z_2| = |z_3| = r > 0$ and $z_1 + z_2 + z_3 \neq 0$.

Prove that $\left|\dfrac{z_1 z_2 + z_2 z_3 + z_3 z_1}{z_1 + z_2 + z_3}\right| = r$

b. Find all cube roots of $\sqrt{3} + i$.

3. Find all zeros of the polynomial $x^6 - 3x^5 - 5x^4 + 22x^3 - 39x^2 - 39x + 135$, if it is known that 1 + 2i and $\sqrt{3}$ are two of its zeros.

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4. a. Prove $p \to (q \to r) = (p \wedge q) \to r$ without using truth table.

b. Evaluate $\int_0^{\frac{\pi}{4}} \frac{1}{\sin x + \cos x} dx$

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5. Prove thate

$$\tan^{-1}\left(\frac{2}{11}\right) + \tan^{-1}\left(\frac{7}{24}\right) = \tan^{-1}\left(\frac{1}{2}\right)$$

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6. If X is the random variable with distribution function F(x) given by,

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{2}\left(x^2 + x\right) & 0 \leq x < 1 \\ 1 & x \leq 1 \end{cases}$$

then find (i) the probability density function f(x) (ii) $P(0.3 \leq X \leq 0.6)$

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7. The rate at which the population of a city increases at any time is propotional to the population at that time. If there were 1,30,000 people in the city in 1960 and 1,60,000 in 1990 what population may be anticipated in 2020.[loge(16/13)=.2070;e.42=1.52]

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