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MATHS

BOOKS - SURA MATHS (TAMIL ENGLISH)

SURAS MODAL QUESTION PAPER-1 MATHEMATICS

Section I

1. If $A = \{ (x,y) : y = \sin x, x \in R \}$ and $B = \{ (x,y) : y = \cos x, x \in R\}$ then $A \cap B$ contains

A. no element

B. infinitely many elements

C. only one element

D. cannot be determined

Answer: infinitely many elements

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2. The range of the function $\frac{1}{1-2\sin x}$ is

A. $(\infty, -1) \cup \left(\frac{1}{3}, \infty\right)$

B. $\left(-1, \frac{1}{3}\right)$

C. $\left[-1, \frac{1}{3}\right]$

D. $(\infty, -1] \cup \left[\frac{1}{3}, \infty\right)$

Answer: $(-\infty, -1] \cup \left[\frac{1}{3}, \infty\right)$

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3. The value of $\log_{\sqrt{2}}{}^{512}$ is

A. 16

B. 18

C. 9

D. 12

Answer: 18

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4. The number of roots of $(x+3)^4 + (x+5)^4 = 16$ is

A. 4

B. 2

C. 3

D. 0

Answer: 2

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5. $\frac{1}{\cos 80^\circ} - \frac{\sqrt{3}}{\sin 80^\circ} =$

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 2

D. 4

Answer: 4

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6. If $\sin \alpha + \cos \alpha$= b, then $\sin 2\alpha$ is equal to

A. $b^2 - 1, \quad \text{if} \quad b \leq \sqrt{2}$

B. $b^2 - 1, \quad \text{if} \quad > \sqrt{2}$

C. $b^2 - 1, \quad \text{if} \quad b \geq 1$

D. $b^2 - 1, \quad \text{if} \quad b \geq \sqrt{2}$

Answer: $b^2 - 1, \quad \text{if} \quad \leq \sqrt{2}$

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7. The number of 5 digit numbers all digits of which are odd is

A. 25

B. 5^5

C. 5^6

D. 625

Answer: 5^5

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8. The number of permutations of n different things taking r at a time when 3 particular things are to be included is

A. ${}^{n-3}P_{r-3}$

B. ${}^{n-3}P_r$

C. ${}^{n}P_{r-3}$

D. $r!{}^{n-3}C_{r-3}$

Answer: $r!{}^{n-3}C_{r-3}$

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9. If ${}^{n}C_{10} > {}^{n}C_r$ for all possible r, then a value of n is

A. 10

B. 21

C. 19

D. 20

Answer: 20

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10. Choose the correct statement

A. Matrix addition is not associative

B. Matrix addition is not commutative

C. Matrix multiplication is associative

D. Matrix multiplication is commutative

Answer: Matrix multiplication is associative

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11. Find the odd one out of the following

A. $\begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 0 & \frac{-7}{2} \\ \frac{7}{2} & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 3.2 \\ -3.2 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

Answer: (a),(b),(c) are skew symmetric and (d) symmetric (4) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

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12. Match List-I with List II

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A. $\begin{matrix} (i) & (ii) & (iii) & (iv) \\ d & c & a & b \end{matrix}$

B. $((i),(ii),(iii),(iv)),(d,c,b.\,a)$

C.
(i)	(ii)	(iii)	(iv)
b	a	c	a

D.
(i)	(ii)	(iii)	(iv)
b	c	a	d

Answer: i-b ,ii-c,iii-a, iv-d

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13. Two vertices of a triangle have position vectors $3\hat{i}+4\hat{j}-4\hat{k}$ and $2\hat{i}+3\hat{j}+4\hat{k}$. If the position vector of the centroid is

$\hat{i} + 2\hat{j} + 3\hat{k}$, then the position vector of the third vertex is

A. $-2\hat{i} - \hat{j} + 9\hat{k}$

B. $-2\hat{i} - \hat{j} - 6\hat{k}$

C. $-2\hat{i} - \hat{j} + 6\hat{k}$

D. $2\hat{i} - \hat{j} + 6\hat{k}$

Answer: $-2\hat{i} - \hat{j} + 9\hat{k}$

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14. Choose the incorrect pair :

A. $\sin x \quad x \in R$

B. $\cos x \quad x \in R$

C. $\log x \quad x > 0$

D. $e^{-x} \quad x > 0$

Answer: Hint: e^{-x} **can be defined in** $\mathbb{R}(4)e^{-x}; x > 0$

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15. $\lim_{x \to 3} \left\lfloor x \right\rfloor =$

A. 2

B. 3

C. does not exist

D. 0

Answer: does not exist

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16. The function $y = \frac{|3x - 4|}{3x - 4}$ is discontinuous at x =

A. 0

B. $\frac{3}{4}$

C. $\frac{4}{3}$

D. 1

Answer: $\frac{4}{3}$

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17. For the curve $\sqrt{x} + \sqrt{y} = 1$, $\frac{dy}{dx}$ at $\left(\frac{1}{4}, \frac{1}{4}\right)$ is

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

B. 1

C. -1

D. 2

Answer: -1

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18. $\int \frac{x+2}{\sqrt{x^2-1}} dx$ is

A. $\sqrt{x^2}-1-2\log\left|x+\sqrt{x^2-1}\right|+c$

B. $\sin^{-1}x-2\log\left|x+\sqrt{x^2-1}\right|+c$

C. $2\log\left|x+\sqrt{x^2-1}\right|-\sin^{-1}x+c$

D. $\sqrt{x^2-1}+2\log\left|x+\sqrt{x^2-1}\right|+c$

Answer: $\sqrt{x^2-1}+2\log\left|x+\sqrt{x^2-1}\right|+c$

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19. Assertion (A) : In rolling die, getting number

Reason (R) : In a die contains only numbers 1,2,3,4,5,6

A. Both (A) and (R) are true and (R) is the correct explantion of (A)

B. Both (A) and (R) are the true but (R) is not the correct explantion of (A)

C. (A) is true (R) is false

D. (A) is false (R) is true

Answer: (a) is false (R) is true

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20. If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct ?

A. $P(A/B) = \dfrac{P(A)}{P(B)}$

B. $P(A/B) < P(A)$

C. $P(A/B) \geq P(A)$

D. $P(A/B) > P(B)$

Answer: $P(A/B) \geq P(A)$

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Section Ii

1. Show that the relation R in the set $\{1, 2, 3\}$ given by $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3)\}$ is reflexive but neither symmetric nor transitive.

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2. A model rocket is launched from the ground. The height 'h' reached by the rocket after t seconds from lift off is given by h(t) = $-5t^2 + 100t, 0 \leq t \leq 20$. At what time the rocket is 495 feet above the ground?

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3. Find the values of

sin (-1110°)

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4. A Kabaddi coach has has 14 players ready to play . How many different teams of 7 players could the coach put on the court ?

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5. Find a negative value of m if the Co-effcient of x^2 in the expanion of $(1+x)^m$, $|x| < 1$ is 6 .

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6. Find the value or values of m for which m $\left(\hat{i}+\hat{j}+\hat{k}\right)$ ia a unit vector .

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7. Solve : $\lim_{x \to 2} \frac{x^4 - 16}{x - 2}$

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8. Solve : $y = \sin x + \cos x$

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9. Integrate $\sqrt[3]{x^4}$

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10. Five mangoes and 4 apples are in a box . If two fruits are chosen at random, find the probability that

one is a mango and the other is an apple .

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Section Iii

1. A plumber can be paid according to the following schemes, In the first scheme he will be paid rupees 500 plus rupees 70 per hour,

and in the second scheme he will paid 120 rupees per hour. If he works x hours. Then for what value of x does the first scheme give better wages?

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2. If in two circles, arcs of same length subtend angles 60° and 75° at the centre, find the ratio of their radii?

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3. Find the sum of all 4-digit numbers that can be formed using digits 1, 2, 3, 4, and 5 repetitions not allowed?

4. If a,b,c are in A.P. b,c,d are in G.P,c,d,e are in H. P. then show that a,c,e are in G. P.

5. Find the equation of the locus of a point such that the sum of the squares of the distance from the points (3, 5), (1, -1) is equal to 20.

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6. Construct the matrix $A = \left[a_{ij}\right]_{3\times 3}$, where $a_{ij} i - j.$

State whether A is symmetric or skew-symmetric .

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7. Find the vectors of magnitude $10\sqrt{3}$ that are perpendicular to the plane which contains $\hat{i}+2\hat{j}+\hat{k}$ and $\hat{i}+3\hat{j}+4\hat{k}$

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8. If $f(x)=\frac{2x+3\sin x}{3x+2\sin x}, x\neq 0$ is continuous at x = 0 , then find f(0)

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9. Find the derivatives from the left and from the right at x=1 (if they exist) of the following functions. Are the functions differentiable at x=1?

$f(x) = \sqrt{1 - x^2}$

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10. If $f''(x) = 12x - 6$ and $f(1) = 30$, $f'(1) = 5$ find $f(x)$

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Section Iv

1. The formula for converting from Fahrenheit to Celsius temperatures is $y = \frac{5x}{9} - \frac{160}{9}$. Find the inverse of this function and determine whether the inverse is also a function.

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2. If $\cos(\alpha-\beta)+\cos(\beta-\gamma)+\cos(\gamma-\alpha)=\frac{-3}{2}$ then prove that $\cos\alpha+\cos\beta+\cos\gamma=\sin\alpha+\sin\beta+\sin\gamma=0$.

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3. By the principle of mathematical induction , prove that for $n \geq 1$

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4. By the principle of mathematical induction, prove that, for $n \geq 1$

$$1^3 + 2^3 + 3^3 + \ldots + n^3 = \left(\frac{n(n+1)}{2} \right)^2$$

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5. Find the sum up to the 17^{th} term of the series $\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \ldots$

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6. A ray of light coming from the point (1,2) is reflected at a point A on the x-axis and it passes through the point (5,3). Find the co-ordinates of the point A.

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7. Solve $\begin{vmatrix} 4-x & 4+x & 4+x \\ 4+x & 4-x & 4+x \\ 4+x & 4+x & 4-x \end{vmatrix} = 0$

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8. Show that the vectors are coplanar

$\hat{i} - 2\hat{j} + 3\hat{k}, \ -2\hat{i} + 3\hat{j} - 4\hat{k}, \ -\hat{j} + 2\hat{k}$

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9. Show that the following vectors are co-planar

(ii)

$5\hat{i} + 6\hat{j} + 7\hat{k}, 7\hat{i} - 8\hat{j} + 9\hat{k}, \ -3\hat{i} + 20\hat{j} + 5\hat{k}$

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10. Examine the continuity of the following :

x + sinx

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11. Examine the continuity of the following:

$x^2 \cos x$

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12. Examine the continuity of the following:

$e^x \tan x$

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13. Examine the continuity of the following:

$e^{2x} + x^2$

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14. Examine the continuity of the following:

$x . \ln x$

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15. Find the derivative with $\tan^{-1}\left(\frac{\sin x}{1+\cos x}\right)$ with respect to $\tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$

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16. $\frac{1}{\sqrt{x+3}-\sqrt{x-4}}$

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17. A firm manufactures PVC pipes in three plants viz, X,Y and Z. The daily production volumes from the three firms X,Y and Z are respectively 2000 units, 3000 units and 5000 units. It is known from the past experience that 3% of the output from plant X,4% form plant Y and 2% from plant Z are defective. A

pipe is selected at random from a days total production,

(i)find the probability that the selected pipe is a defective one

(ii)if the selected pipe is a defective ,then what is the probability that it was produced by plant Y?

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18. A firm manufactures PVC pipes in three plants viz, X ,Y and Z . The deily production

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if the selected pipe is a defective , then what is the probability that it was produced by plant Y ?

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19. Evaluate $\int \frac{x^2 + 5x + 3}{x^2 + 3x + 2} dx$

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20. Solve: $\sqrt{x + 5} + \sqrt{x + 21} = \sqrt{6x + 40}$

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