MATHS

BOOKS - SURA MATHS (TAMIL ENGLISH)

SURAS MODEL QUESTION PAPER -2

Section I

1. Let R be the universal relation on a set X with more than one element. Then R is

A. not reflexive

B. not symmetric

C. transitive

D. none of the above

Answer: C

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2. The range of the function f(x) = $|\lfloor x \rfloor - x|$, $x \in \mathbb{R}$ is

A. [0,1]

B. $[0, \infty]$

C. [0,1]

D. (0,1)

Answer: C

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3. The solution of $5x - 1 < 24$ and $5x + 1 > -24$ is

A. 4,5

B. (-5,-4)

C. (-5,5)

D. (-5,4)

Answer: C

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4. Find the odd one of the following

A. $x^3 + 3x^2 + 2x + 1$

B. $\left(x^2 + 2x + 1\right)(x + 4)$

C. $x^2 + 5x + 6$

D. (x+2) (x + 3) (x + 4)

Answer: C

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5. $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \ldots + \cos 179^\circ$ =

A. 0

B. 1

C. -1

D. 89

Answer: A

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6. Assertion (A) : cos x = $\frac{-1}{2}$ and 0 lt x lt 2pi, then the solutions are $x = \frac{2\pi}{3}, \frac{4\pi}{3}$.

Reason (R) : cos is negative in the first and fourth quadrant only

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

B. Both A and R are 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: C

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7. The product of r consecutive positive integers is divisible by

A. r!

B. r! + 1

C. (r + 1)

D. none of these

Answer: D

8. In a plane are 10 points are there out of which 4 points are collinear, then the number of triangles formed is

A. 110

B. $.^{10}C_3$

C. 120

D. 116

Answer: D

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9. The equation of the locus of the point whose distance from y-axis is half the distance from origin is

A. $x^2 + 3y^2 = 0$

B. $x^2 - 3y^2 = 0$

C. $3x^2 + y^2 = 0$

D. $3x^2 - y^2 = 0$

Answer: C

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10. θ is acute angle between the lines $x^2 - xy - 6y^2 = 0$, then $\dfrac{2\cos\theta + 3\sin\theta}{4\sin\theta + 5\cos\theta}$ is

A. 1

B. $-\dfrac{1}{9}$

C. $\dfrac{5}{9}$

D. $\dfrac{1}{9}$

Answer: B

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11. Match list

	List I		List II
$i.$	$\begin{bmatrix} a & b \\ b & a \end{bmatrix}$	(a)	identity
$ii.$	$\begin{bmatrix} 0 & b \\ -b & 0 \end{bmatrix}$	(b)	singular matrix
$iii.$	$\begin{bmatrix} a & a \\ b & b \end{bmatrix}$	(c)	Skew-Symmetric
$iv.$	$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	(d)	Symmetric

The correct match is

(i) (ii) (iii) (iv)

A. d,c,b,a

B. c,d,b,a

C. b,a,d,c

D. b,d,a,c

Answer: A

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12. If $\lfloor . \rfloor$ denotes the greatest integer less than or equal to the real number under consideration and $-1 \leq x < 0, 0 \leq y < 1, 1 \leq z < 2$, then the value of the determinant $\begin{vmatrix} \lfloor x \rfloor + 1 & \lfloor y \rfloor & \lfloor z \rfloor \\ \lfloor x \rfloor & \lfloor y \rfloor + 1 & \lfloor z \rfloor \\ \lfloor x \rfloor & \lfloor y \rfloor & \lfloor z \rfloor + 1 \end{vmatrix}$ is

A. [z]

B. [y]

C. [x]

D. [x] + 1

Answer: C

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13. The value of $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{DA} + \overrightarrow{CD}$ is

A. $\overrightarrow{AD}$

B. $\overrightarrow{CA}$

C. $\overrightarrow{0}$

D. $\overrightarrow{-AD}$

Answer: C

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14. The vector in the direction of the vector $\hat{i} - 2\hat{j} + 2\hat{k}$ that has magnitude 9 is

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

B. $\frac{\hat{i} - 2\hat{j} + 2\hat{k}}{3}$

C. $3\left(\hat{i} - 2\hat{i} + 2\hat{k}\right)$

D. $9\left(\hat{i} - 2\hat{j} + 2\hat{k}\right)$

Answer: D

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15. $\lim_{x \to 0} \frac{\sqrt{1 - \cos 2x}}{x}$

A. 0

B. 1

C. $\sqrt{2}$

D. does not exist

Answer: C

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16. Choose the correct statement

A. Derivative of odd function is odd

B. Derivative of even function is even

C. Inverse of odd function is even

D. Inverse function of sin x is $\sin^{-1} x$

Answer: B

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17. $\int e^{-4x} \cos x dx$ is

A. $\frac{e^{-4x}}{17}[4\cos x + \sin x] + c$

B. $\frac{e^{-4x}}{17}[-4conx + \sin x] + c$

C. $\frac{e^{-4x}}{17}[-4\cos x + \sin x] + c$

D. $\frac{e^{-4x}}{17}[-4\cos x - \sin x] + c$

Answer: D

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18. $\int 2^{3x+5} dx$ is

A. $\frac{3(2^{3x+5})}{\log 2} + c$

B. $\frac{2^{3x+5}}{2\log(3x+5)} + c$

C. $\frac{2^{3x+5}}{2\log 3} + c$

D. $\frac{2^{3x+5}}{2\log 2} + c$

Answer: A

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19. Choose the incorrect pair

A. A nad B disjoint $P(A \cap B) = P(A) + P(B)$

B. A and B independent $P(A \cap B) = P(A)P(B)$

C. A and B disjoint $P(A \cap B) = 0$

D. A and B independent $P(A/B) = P(B/A)$

Answer: D

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20. A speaks truth in 75 % cases and B speaks truth in 80 % cases. Probability that they contradict each other in a

A. $\frac{7}{20}$

B. $\frac{13}{20}$

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

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

Answer: A

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Section Ii

1. Determine the value of x+y if

$$\begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y-13 \\ y & x+6 \end{bmatrix}$$

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2. If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$, then compute A^4

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3. Let $\vec{a}$ and $\vec{b}$ be the position vectors of the points A and B. Prove that the position vectors of the points which trisects the line segment AB are $\frac{\vec{a}+2\vec{b}}{3}$ and $\frac{\vec{b}+2\vec{a}}{3}$.

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4. If $\overrightarrow{PO} + \overrightarrow{OQ} = \overrightarrow{QO} + \overrightarrow{OR}$ prove that the points P,Q,R are collinear .

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5. $\lim_{x \to \infty} \frac{\sin x}{x}$ is

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6. If the limit does not exist explain why ?

$\lim_{x \to 1} \left(x^2 + 2\right)$

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7. 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?

$f(x) = |x - 1|$

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8. Show that the following functions are not differentiable at the indicated value of x.

$$f(x) = \begin{cases} 3x, & x < 0 \\ -4x, & x \geq 0 \end{cases}, x = 0$$

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9. $4\cos(5-2x)+9e^{3x-6}+\frac{24}{6-4x}$

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10. An experiment has the four possible mutually exculusive and exhaustive outcomes A,B,C and D. Check whether the following assignments of probability are permissible.(i)

$P(A)=0.15, P(B)=0.30, P(C)=0.43, P(D)=0.12$

(ii)

$P(A)=0.22, P(B)=0.38, P(C)=0.16, P(D)=0.34$

(iii)

$$P(A) = \frac{2}{5}, P(B) = \frac{3}{5}, P(C) = -\frac{1}{5}, P(D) = \frac{1}{5}$$

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Section Iii

1. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$ show that A^2 is a unit matrix .

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2. Give your own examples of matrices satisfying the following conditions in each case.

(i) A and B such that AB $\neq$ BA

(ii) A and B such that AB =0 - BA, $A \neq 0$ and $B \neq 0$

A and B such that AB = 0 , and BA $\neq$ 0`

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3. In a triangle ABC, if D and E are mid points of sides AB and AC respectively. Show that $\overrightarrow{BE} + \overrightarrow{DC} = \frac{3}{2}\overrightarrow{BC}$.

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4. verify whether the following ratios are direction cosines of some vector or not .

(i) $\frac{1}{5}, \frac{3}{5}, \frac{4}{5}$ (ii) $\frac{1}{\sqrt{2}}, \frac{1}{2}, \frac{1}{2}$

$\frac{4}{3}, 0, \frac{3}{4}$

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5. Evaluate the limits :

$$\lim_{x \to 5} \frac{\sqrt{x+4} - 3}{x - 5}$$

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6. If $y = \frac{\tan x - 1}{\sec x}$ then $\frac{dy}{dx} = ?$

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7. $y = \tan\theta(\sin\theta + \cos\theta)$ find $\frac{dy}{d\theta}$.

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8. If $f'(x) = 4x - 5$ and $f(2) = 1$, find f(x).

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9. If f'(x) = 4x -4 and f(0) = -3, find f(x)

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10. An integer is chosen at random from the first 100 positive integers. What is the probability that the integer chosen is a prime or multiple of 8?

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Section Iv

1. If $A = \begin{bmatrix} 4 & 2 \\ -1 & x \end{bmatrix}$ and such that

(A -2I) (A -3 I) = 0 , find the value of x .

(b) Give your own examples of matrices satisfying the following conditions in each case :

(i) A and B such that AB $\neq$ BA

(ii) A and B such that AB = 0 = BA, $A \neq 0$ and $B \neq 0$

(iii) A and B such that AB = 0 and $BA \neq 0$

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2. Find the direction cosines and direction rations for the following vectors

(i) $3\hat{i} - 4\hat{j} + 8\hat{k}$ (ii) $3\hat{i} + \hat{j} + \hat{k}$

(iii) $\hat{j}$ (iv) $5\hat{i} - 3\hat{j} - 48\hat{k}$

(v) $3\hat{i} - 3\hat{k} + 4\hat{j}$

(vi) $\hat{i} - \hat{k}$

OR

(b) Show that the points whose position vectors

$4\hat{i} + 5\hat{j} + \hat{k}, \ -\hat{j} - \hat{k}, 3\hat{i} + 9\hat{j} + 4\hat{k}$ and $-4\hat{i} + 4\hat{j} + 4\hat{k}$

are conplanar.

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3. Examine the continuity of the following

(i) x + sin x

(ii) $x^2 \cos x$

(iii) $e^x \tan x$

(iv) $e^{2x} + x^2$

(v) x. ln x

(vi) $\frac{\sin x}{x^2}$

(vii) $\frac{x^2 - 16}{x + 4}$

(viii) |x +2 | + | x -1|

(ix) $\frac{|x + 2|}{|x + 1|}$

(x) cot x + tan x

OR

find the points of discontinuity of the function f, where

(i) $f(x) = \begin{cases} 4x + 5 & \text{if } x \leq 3 \\ 4x - 5 & \text{if } x > 3 \end{cases}$

(ii) $f(x) = \begin{cases} x + 2 & \text{if } x \geq 2 \\ x^2 & \text{if } x < 2 \end{cases}$

$f(x) = \begin{cases} x^3 - 3 & \text{if } x \leq 2 \\ x^2 + 1 & \text{if } x > 2 \end{cases}$

(iv) if $f(x) = \begin{cases} \sin x & 0 \leq x \leq \frac{\pi}{4} \\ \cos x & \frac{\pi}{4} < x < \frac{\pi}{2} \end{cases}$

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4. If f(x) = |x + 100| + x^2 test whether f(-100) exists

or (b) Examine the differentiability of functions in $\mathbb{R}$ by drawing the diagrams

(i) | sin x| (ii) | cos x |

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5. (a) A ball is thrown vertically upward from the ground with an initial velocity of 39.2 m/sec. if the only force consdiered is that attributed to the acceleration due to gravity , find

(i) How long will it take for the ball to strike the ground ?

(ii) the speed with which will it strike the ground ? and

(iii) how high the ball will rise ?

(OR)

(b) A wound is healing in such a way that t days since Sunday the area of the wound has been decreasing at a rate of $-\frac{3}{(t+2)^2} cm^2$ per day. If on Monday the area of the wound was 2 cm^2

(i) What was the area of the wound on Sunday ?

(ii) What is the anticipated area of the wound on Thursday if it continues to heal at the same rate ?

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6. The probability that a new railway bridge will get an award for its design is 0.48, the probability that it will get an award for the efficient use of materials is 0.36, and that it will get both awards is 0.2. What is the probability, that

(i) it will get at least one of the awards

(ii) it will get only one of the awards.

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7. (a) The probability that a car being filled with petrol will also need an oil change is 0.30 , the probability that It needs a new , oil filter is 0.40 . And the probability that both the oil filiter need changing is 0.15.

(OR)

(b) An advertisiting executive is studying television viewing habits of married men and woman during prime time hours. Based ont he past viewing records he has determined that during prime time wives are watching television 60% of the time. It has also been determined that when the wife is watching . When the wife is not watching the television 30 % of the time the husband is watching the televison . find the probability that (i) The husband is watching the television during the prime

time of television (ii) if the husband is watching the television , the wife is also watching the television .

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