MATHS

BOOKS - SUNSTAR MATHS (KANNADA ENGLISH)

II PUC MATHEMATICS P.U. BOARD LATEST MODEL QUESTION PAPER - 1

Part A

1. A relation R on A $= \{1, 2, 3\}$ defined by $R = \{(1, 1), (1, 2), (3, 3)\}$ is not symmetric. Why?

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2. Write the principal value branch of $f(x) = \sin^{-1} x$.

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3. Define a diagonal matrix.

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4. A square matrix A, of order 3, has |A|=5, find |A.adj A|.

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5. Differentiate the functions with respect to x .

$\cos(\sin x)$

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6. Evaluate : $\int \frac{\log x}{x} dx$.

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7. For what value of λ, is the vector $\frac{2}{3}i - \lambda j + \frac{2}{3}k$ a unit vector ?

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8. Find the direction ratio of the line $\frac{x-1}{2} = 3y = \frac{2z+3}{4}$

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9. Define optimal solution in linear programming problem.

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10. IF $P(A) = \frac{1}{2}, P(B) = 0$, then find P(A/B) if exists.

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Part B

1. Find the gof and fog if f(x) = $8x^3$ and $g(x) = x^{\frac{1}{3}}$

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2. Write the function $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right) x \neq 0$, in the simplest form.

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3. Prove that $\tan^{-1}\left(\frac{1}{3}\right)+\tan^{-1}\left(\frac{1}{7}\right)+\tan^{-1}\left(\frac{1}{13}\right)+\ldots\ldots\ldots+\tan^{-1}\left(\frac{1}{n^2+n+1}\right.$ $=\frac{\pi}{4}$

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4. If area of the triangle with vertices (-2, 0), (0, 4) and (0, k) is 4 square units, find the value of 'k' using determinants.

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5. Find $\frac{dy}{dx}$, if $y + \sin y = \cos x, \quad \text{where} \quad y \neq (2n+1)\pi$

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6. If $x = 2at, y = \frac{4}{t}$. Find $\frac{dy}{dx}$

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7. Show that the function f given by $f(x) = x^3 - 6x^2 + 17x - 420$ is strictly increasing on R.

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8. Find $\int e^x \sec x(1 + \tan x)dx$

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9. Evaluate : $\int \frac{dx}{\sin^2 \cos^2 x}$

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10. Find the order and degree of the differential equation

$\frac{d^2y}{dx^2} = \cos 3x + \sin 3x$

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11. The position vectors of two points P and Q are $\hat{i} + 2\hat{j} - \hat{k}$ and $-\hat{i} + \hat{j} + \hat{k}$ respectively. Find the position vector of a point R which divides the line $\overline{PQ}$ in the ratio 2 : 1 internally.

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12. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, then $3\vec{a}.\vec{b} + 2\vec{b}.\vec{c} + \vec{c}.\vec{a} =$

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13. Find the angle between the pair of lines

$\vec{r} = 3\hat{i} + 5\hat{j} - \hat{k} + \lambda\left(\hat{i} + \hat{j} + \hat{k}\right)$ and $\vec{r} = 7\hat{i} + 4\hat{k} + \mu\left(2\hat{i} + 2\hat{j} + 2\hat{k}\right)$

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14. If

$P(E_1) = 1/2, P(E_2) = 1/2$ and $P(A/E_1) = 1/2, P\left(\frac{A}{E_2}\right) = 1/4.$

Find $P(E_1/A)$.

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Part C

1. Consider the binary opertions $* : R \times R \to R$ and $o : R \times R \to R$ defined as $a * b = |a - b|$ and $aob = a$, $\forall a, b \in R$. Show that $*$ is commutative but not associative, o is associative but not commutative.

Further, show that $\forall a, b, c \in R, a * (boc) = (a * b)o(a * c)$. [If it is so, we say that the opertion $*$ distributes over the opertion 0]. Does o distribute over $*$? Justify your answer.

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2. Prove that $\cos^{-1}\frac{4}{5} + \cos^{-1}\frac{12}{13} = \cos^{-1}\frac{33}{65}$

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3. Express $\begin{bmatrix} 1 & 5 \\ -1 & 2 \end{bmatrix}$ as the sum of symmetric and skew symmetric matrices.

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4. If $y = \sin^{-1}\left(\frac{2^{x+1}}{1+4^x}\right)$, find $\frac{dy}{dx}$.

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5. If $y = x^x + x^a + a^x + a^a$, find $\frac{dy}{dx}$

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6. Find two positive numbers x and y such that x + y = 60 and xy^3 is maximum.

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7. Evaluate $\int \frac{e^x(1+x)}{\cos^2(xe^x)} dx$

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8. Evaluate $\int_2^3 x^2 dx$ as the limit of sum.

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9. Find the area between the curves y = x and y = x^2.

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10. For the differential equation $xy\frac{dy}{dx} = (x+2)(y+2)$, find the solution curve passing through the point (1, -1).

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11. Find the unit vector perpendicular to each of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ where $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$

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12. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{O}$, find the value of $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$.

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13. Find the angle between the line $\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$ and the plane 10x + 2y - 11z = 3.

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14. Two dice are thrown simultaneously. If X denotes the number of sixes. Find the mean (expectation) of X.

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Part D

1. If R, is the set of all non - negative real numbers prove that the function $f: R_+ \to [-5, \infty]$ defined by $f(x) = 9x^2 + 6x - 5$ is invertible. Write also $f^{-1}(x)$.

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2. If $A = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$, $B = [1 \quad 5 \quad 7]$ Verify that $(AB)^1 = B^1 A^1$.

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3. Solve the following system of equation by using matrix method :

$x + y + z = 6, y + 3z - 11 = 0$ and $x + z = 2y$.

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4. If $e^y(x + 1) = 1$. Show that $\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2$

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5. The volume of a cube is increasing at a rate of 9cc/sec. How fast is the surface area increasing when the length of an edge is 10 cm.

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6. Find the integral of $\frac{1}{\sqrt{x^2 - a^2}}$ with respect to x and hence evaluate $\int \frac{1}{\sqrt{4x^2 - 25}} dx$.

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7. Find the area bounded by the curve $x^2 = 4y$ and the line $x = 4y - 2$.

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8. Solve the differential equation $x\frac{dy}{dx} + 2y = x \log x$.

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9. If a fair coin is tossed 6 times. Find the probability of (i) at least five heads and (ii) exactly 5 heads.

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Part E

1. a) Prove that $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$ and evaluate $\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\tan x}}$

b) Prove that

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2 & -2a & 1-a^2-b^2 \end{vmatrix} = \left(1+a^2+b^2\right)^3$$

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2. a) Solve the following linear programming problem graphically :

Minimize and maximize Z = x + 2y, subject to constraints

$x + 2y \geq 100, 2x - y \leq 0, 2x + y \leq 200, x, y \geq 0.$

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