MATHS

BOOKS - SUNSTAR MATHS (KANNADA ENGLISH)

II PUC MATHEMATICS (ANNUAL EXAM QUESTION PAPER MARCH - 2015)

Part A

1. Let * be a operation defined on the set of non zero rational numbers by $a \cdot b = \frac{ab}{4}$ Find the identity element.

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2. Write the value of x for which

$$2\tan^{-1}x = \cos^{-1}\left[\frac{1-x^2}{1+x^2}\right]$$ holds:

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3. Construct 2×2 matrix A=[aij] whose elements are given by:

$$a_{ij} = \frac{1}{2}|-3i+j|$$

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4. Find the value of x for which:

$$\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$$

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5. $y = \sin(x^2 + 5)$, Find $\frac{dy}{dx}$

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6. Evaluate:

$$\int e^x \left(\frac{x-1}{x^2}\right) dx$$

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7. Define negative of a vector.

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8. Write the direction cosines of x-axis.

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9. Define Feasible region in LPP.

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10. If $P(A) = \frac{3}{5} P(B) = \frac{1}{5}$. Find $P(A \cap B)$ if A an B are independent events.

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Part B

1. Show that if $f: A \to B$ and $g: B \to C$ are one-one then $fog: A \to C$ is also one-one.

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2. Show that $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\sin^{-1}x$,

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3. Show that $2\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{7}\right)=\tan^{-1}\left(\frac{31}{17}\right)$

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4. If the 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. Differentiate $\left(x+\frac{1}{x}\right)^{x}$ w.r.t.x

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6. Find the slope of the tangent to the curve.

$y=\frac{x-1}{x-2}x\neq 2$ at $x=10$

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7. Find $\frac{dy}{dx}$, If $x^2+xy+y^2=100$

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8. Evaluate: $\int \frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha} dx$

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9. Evaluate: $\int \frac{dx}{x - \sqrt{x}}$

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10. Find the order and degree (it defined) of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right)$ + 1 = 0 .

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11. Find $\left|\vec{b}\right|$ if $\left(\vec{a}+\vec{b}\right).\left(\vec{a}-\vec{b}\right)=8$ and $\left|\vec{a}\right|=8\left|\vec{b}\right|$

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12. Find the area of the parallelogram whose adjacent sides are determined by the vectors.

$\vec{a}=\hat{i}+\hat{j}+3\hat{k}$ and $\vec{b}=2\hat{i}+7\hat{j}+\hat{k}$

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13. Find the angle between pair of lines given by:

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

^ j − 4 ^ k + λ (^ i + 2 ^ j + 2 ^ k)

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14. Let X denote the number of hours you study during randomly selected school day to probability that X can take the values of x, has the following form.

$$P(X=x)=\begin{cases}0.1 & If x=0\\ kx & \text{if } x=1 \text{ or } 2\\ k(5-x) & \text{if } x=3 \text{ or } 4\\ 0 & \text{otherwise}\end{cases}$$ find the value of k

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Part C

1. Determine whether the relation R in the set $A = \{1, 2, 3, \ldots . .13, 14\}$ defined as $R = \{(x, y) : 3x - y = 0\}$ is reflexive symmetric and transitive.

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2. If $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$, then find the value x.

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3. If A and B are invertible matrices of same order then prove that $(AB)^{-1} = B^{-1}A^{-1}$

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4. Verify Rolles theorem for the function:

$f(x) = x^2 + 2x - 8, x \in [-4, 2]$

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5. $x = \sqrt{a^{\sin^{-1} t}}, y = \sqrt{a^{\cos^{-1} t}}$, Prove that: $\frac{dy}{dx} = -\frac{y}{x}$

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6. Find the two positive numbers whose sum is 15 and sum of whose squares minimum.

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7. Evaluate: $\int x \tan^{-1} x dx$

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8. $\int_{e}^{2} d^{x} dx$ as a limit of sum:

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9. Find the area of the region bounded by the curve $y^2 = 4x$ and line $x = 3$.

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10. Show that the position vector of the point P, which divides the line joining the points A and B having position vector a and b internally in the ratio:

m:n is $\frac{m\vec{b} + n\vec{a}}{m+n}$

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11. Show that the four points which the position:

Vectors:

$4\hat{i} + 8\hat{j} + 12\hat{k}, 2\hat{i} + 4\hat{j} + 6\hat{k}, 3\hat{i} + 5\hat{j} + 4\hat{k}, 5\hat{i} + 8\hat{j} + 5\hat{k}$

are coplanar:

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12. Find the equation of plane passing through the intersection of the planes. $3x - y + 2z - 4 = 0, x + y + z + 2 = 0$ and Point (2, 2, 1)

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13. Form the differential equation of circles touching the x-axis at origin:

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14. An insurance company insured 2000 scooter drivers 4000 car drivers and 6000 - truck drivers. The probability of an accident are 0.01, 0.03 and 0.15 respectively one of the insured person meets with an accident. What is the probability that he is a scooter driver.

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Part D

1. Let R+ be the set of all non negative real numbers. Show that the function $f: R_+ \to [4, \infty]$ given by $f(x) = x^2 + 4$ is invertible and write inverse of 'f'.

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2. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$ then show that $A^3 - 23A - 40I = 0$

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3. Solve:

$2x + 3y + 3z = 5$

$x - 2y + z = -4$

$3x - y - 2z = 3$ using matrix method

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4. If $Y = Ae^{mx} + Be^{nx}$ show that:

$$\frac{d^2y}{dx^2} - (m+n)\frac{dy}{dx} + mny = 0$$

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5. A particle moves along the curve $6y = x^3 + 2$. Find the points on the curve at which the y coordinate is changing 8 times as fast as the x - coordinate.

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6. Find the integral of $\frac{1}{\sqrt{x^2 - a^2}}$ with respect to x and hence evaluate $\int \frac{dx}{\sqrt{x^2 + 6x - 7}}$.

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7. Using integration find the area of the triangular region whose sides have the equations

$Y = 2x + 1, y = 3x + 1$ and $x = 4$.

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8. Solve the differential equations: $\frac{dy}{dx} + y\sec x = \tan x 0 \leq x \leq \frac{\pi}{2}$

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9. Derive the equation of the line in space passing through a point and parallel to a vector both in vector and cartesian form.

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10. A die is thrown 6 time if getting an odd numbers is a success. What is the probability of

a. 5 successes

b. at least 5 successes

c. at most 5 successes

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Part E

1. Prove that: $\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx & f(x) \text{ is even} \\ 0 & f(x) \text{ is odd} \end{cases}$ and hence Evaluate $\int_{-t}^{t} \sin^5(x)\cos^4(x)dx$

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2. Prove that: $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \end{vmatrix}$

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3. Solve graphically: Maximize

$z = 8000x + 12000y$ subjected to

$9x + 12y \leq 180, x + 3y \leq 30, x \geq 0' y \geq 0$

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4. Find the value of k so that the function:

$$f(x) = \begin{bmatrix} kx+1 & \text{if } x \leq 5 \\ 3x-5 & \text{if } x > 5 \end{bmatrix}$$ at x=5 is a continous function:

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