MATHS

BOOKS - SUNSTAR MATHS (KANNADA ENGLISH)

II PUC MATHEMATICS ANNUAL EXAM QUESTION PAPER JULY -2018

Part A

1. The relation R in the set {1,2,3} given by R= {(1,1),(2,2),(3,3),(1,2),(2,3)} is not transitive. Why?

2. Write the range of $y = \cos^{-1} x$

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3. If a matrix has 5 elements, what are the possible orders it can have?

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4. Find the value of x for which

$$\begin{bmatrix} x & 2 \\ 18 & x \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 18 & 6 \end{bmatrix}$$

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5. If y= sin(ax+b) find $\frac{dy}{dx}$

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6. Find $\int \sec x(\sec x + \tan x)dx$

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7. Define negative of a vector.

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8. The cartesian equation of a line is $\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2}$. Write its vector form.

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9. Define optimal solution in linear programming problem.

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10. Find $P(A \mid B)$ if P(B)=0.5 and $P(A \cap B) = 0.32$

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Part B

1. Define binary operation on a set. Verify whether the operation * defined on Q set of rational number by $a \cdot b = ab + 1 \forall a, b \in Q$ is commutative or assosiative.

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

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3. Find the value of $\cos^{-1}\left(\cos\left(\frac{13\pi}{6}\right)\right)$

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4. If the area of the triangle with vertices (2,-6), (5,4) and (k,4) is 35 square units, find values of k using determinants.

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5. Find $\frac{dy}{dx}$ if $y = \sec^{-1}\left(\frac{1}{2x^2 - 1}\right), 0 < x < \frac{1}{\sqrt{2}}$

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6. Differentiate $(\sin x)^{\cos x}$ with respect to x.

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7. If the radius of a sphere is measured as 7m with an error of 0.02 m, then find the approximate error in calculating its volume

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8. Evaluate $\int \cos 6x \sqrt{1 + \sin 6x} dx$

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

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10. Find the order and degree of the differential equation, $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

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11. Find the projection of vec a

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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 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. The random variable X has probability distribution

P(X) of the following form.

$$P(X) = \begin{cases} k & \text{if} \quad X = 0 \\ 2k & \text{if} \quad X = 1 \\ 3k & \text{if} \quad X = 2 \\ 0 & \text{otherwise} \end{cases}$$

Determine value of K

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15. The random variable X has probability distribution P(X) of the following form.

$$P(X) = \begin{cases} k & \text{if} \quad X = 0 \\ 2k & \text{if} \quad X = 1 \\ 3k & \text{if} \quad X = 2 \\ 0 & \text{otherwise} \end{cases}$$

Find $P(X < 2)$

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Part C

1. If $f : R \to R$ and $g : R \to R$ are given by $f(x) = \cos x$ and $g(x) = 3x^2$.Show that $gof \neq fog$

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2. Solve : $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$

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3. By using elementary operations, Find the inverse of the matrix $A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$

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4. If $x = a(\theta - \sin\theta)$ and $y = a(1 + \cos\theta)$ then prove that $\frac{dy}{dx} = -\cot\left(\frac{\theta}{2}\right)$

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5. Verify Mean value theorem, if $f(x) = x^2 - 4x - 3$ in the interval [a,b] where a=1 and b=4

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

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7. Evaluate : $\int_0^1 \frac{\tan^{-1} x}{1+x^2} dx$

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8. Integrate $\frac{dx}{x(x^2+1)}$ with respect to x.

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9. Find the area of the parabola $y^2 = 4ax$ bounded by its latus rectum.

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10. Form the differential equation representing the given family of curves $y = a\sin(x+b)$ where a,b are arbitrary constants.

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

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12. Prove that $\left[\vec{a}+\vec{b}\,\vec{b}+\vec{c}\,\vec{c}+\vec{a}\right]=2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

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

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14. A man is know to speak truth 4 out of 5 times. He tossed a coin and reports that it is head. Find the probability that it is actually head.

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Part D

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

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2. If $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}$ and $B = [-1, 2, 1]$ verify that $(AB)^1 = B^1 A^1$

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3. Solve the following system of linear equations by matrix method

$4x + 3y + 2z = 60, 2x + 4y + 6z = 90, 6x + 2y + 3z = 70$

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4. If $y = Ae^{mx} + Be^{nx}$ prove that $\frac{d^2y}{dx^2} - (m+n)\frac{dy}{dx} + (mn)y = 0$

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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-coorinate is changing 8 times as fast as the x- coordinate.

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

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7. Find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ by the method of integration.

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8. Find the general solution of the differential equation $x\frac{dy}{dx} + 2y = x^2(x \neq 0)$

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9. Derive the equation of a line space passing through two given points both in vector and cartesian form.

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10. A person buys a lottery ticket in 50 lotteries in each of which his chance of winning a prize is 1//100. what is the probability that he will win a prize

atleast once

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11. A person buys a lottery ticket in 50 lotteries in each of which his chance of winning a prize is 1//100. what is the probability that he will win a prize

exactly once

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Part E

1. Prove that

$$\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx & \text{if f(x) is even function} \\ 0 & \text{if f(x) is odd function} \end{cases}$$

and hence evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x dx$

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2. Find the value of k if

$f(x) = \begin{cases} kx^2 & \text{if } \ x \leq 2 \\ 3 & \text{if } \ x > 2 \end{cases}$ is continuous at x=2

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3. Solve the following problem graphically:

Maximum and minimize

Z=10500x+9000y

Subject to the constraints

$x + y \leq 50$

$2x + y \leq 80$

$x \geq 0, y \geq 0$

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4. Prove that

$$\begin{vmatrix} x+y+2z & x & y \\ z & y+z+2x & y \\ z & x & z+x+2y \end{vmatrix} = 2(x+y+z)^3$$

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