MATHS

BOOKS - SUNSTAR MATHS (KANNADA ENGLISH)

II PUC MATHEMATICS ANNUAL EXAM QUESTION PAPER MARCH - 2020

Part A

1. Let * be the binary operation on N given by

a * b = L.C.M. of a and b. Find 5 * 7.

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

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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 values of x for which

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

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5. If $y = \tan\left(\sqrt{x}\right)$, find $\frac{dy}{dx}$.

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6. Find $\int (2x^2 + e^x)\,dx$.

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7. Define negative of a vector.

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8. If a line makes angles $90^\circ, 135^\circ \text{ and } 45^\circ$ with the X, Y and Z-axis respectively, find its direction cosines.

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9. Define optimal solution in Linear Programming problem.

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10. If $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$ find $P(A \cap B)$.

If A and B are independent events

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Part B

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

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2. Prove that $\cot^{-1}(-x) = \pi - \cot^{-1} x,\ \forall x \in R.$

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3. Find the value of $\sin^{-1}\left(\sin\frac{3\pi}{5}\right).$

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4. Find the area of the triangle whose vertices are (-2, -3), (3, 2) and (-1, -8) using determinant method.

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5. Find $\frac{dy}{dx}$, if $\sin^2 x + \cos^2 y = 1.$

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6. If $y = x^x$, find $\frac{dy}{dx}$

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7. Find the interval in which the function f given by $f(x) = x^2 - 4x + 6$ is strictly decreasing.

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8. Find $\int \cos x \log(\sin x) dx.$

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9. Find $\int x \sec^2 x dx.$

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10. Find the order and degree (if defined) of the differential equation

$$\left(\frac{d^2y}{dx^2}\right) + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$$

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11. Find the projection of the vector

$\vec{a} = \hat{i} + 3\hat{j} + 7\hat{k}$ on the vector

$\vec{b} = 7\hat{i} - \hat{j} + 8\hat{k}.$

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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 $\vec{b} = 2\vec{i} - 7\hat{j} + \hat{k}$.

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13. Find the equation of plane with intercept 2,3 and 4 on x,y and z axis respectively.

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14. A random variable X has the following probability distribution :

X	0	1	2	3	4
P(X)	0.1	k	2k	2k	k

find the value of k

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Part C

1. Show that the relation R defined in the set A of all triangles as $R = \{T_1 \quad T_2) : T_1$ is similar to $T_2\}$ is equivalence relation. Consider three right angle triangles T_1 with sides $3, 4, 5, T_2$ with sides $5, 12, 13$ and T_3 with sides $6, 8, 10$. Which triangles among T_1, T_2 and T_3 are related ?

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2. 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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3. If $F(x)=\begin{bmatrix}\cos x & -\sin x & 0\\ \sin x & \cos x & 0\\ 0 & 0 & 1\end{bmatrix}$, show that $F(x)F(y)=F(x+y)$.

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4. If $x=2at^2, y=at^4$ then find $\frac{dy}{dx}$.

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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. Use differential to approximate $\sqrt{36.6}$.

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7. Find $\int \frac{(x-3)}{(x-1)^3} dx$.

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8. Evaluate : $\int_0^{\frac{\pi}{2}} \cos^2 x dx$.

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9. Find the area of the region bounded by $x^2 = 4y, y = 2, y = 4$ and the y-axis in the first quadrant.

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10. Find the equation of a curve passing through the point (-2, 3), given that the slopw of the tangent to the curve at any point (x, y) is $\frac{2x}{y^2}$.

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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. Find x such that the four points A(3,2,1), B(4,x,5), C(4,2,-2) and D(6,5,-1) are coplanar

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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 known to speak truth 3 out of 4 times. He throws a dice and reports that it is a six. Find the probability that it is

actually a six.

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Part D

1. If $f: R \to R$ defined by $f(x) = (4x + 3)$, show that f is invertible and find f^{-1}.

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2. If

$$A = \begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix} \text{ and } C = \begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix}$$

then compute (A + B) and (B - C). Also verify that A + (B - C) = (A + B) - C.

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3. Solve system of linear equations , using matrix method

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

$x - 2y + z = -4$

$3x - y - 2z = 3$

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4. If $y = \left(\tan^{-1} x\right)^2$, show that

$\left(x^2 + 1\right)^2 y_2 + 2x\left(x^2 + 1\right) y_1 = 2.$

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5. Sand is pouting from a pipe at the rate of $12cm^3/s$. The falling sand forms a cone on the ground in such a way that the height of the cone is always one - sixth of the radius of the base. How fast is the height of the sand cone increasing when the height is 4 cm ?

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6. Find the integral of $\frac{1}{x^2+a^2}$ w.r.t x and hence evaluate $\int \frac{1}{x^2+2x+2}dx.$

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7. Using the method of integration, find the area of the smaller region bounded by the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ and the line

$\frac{x}{3} + \frac{y}{2} = 1.$

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

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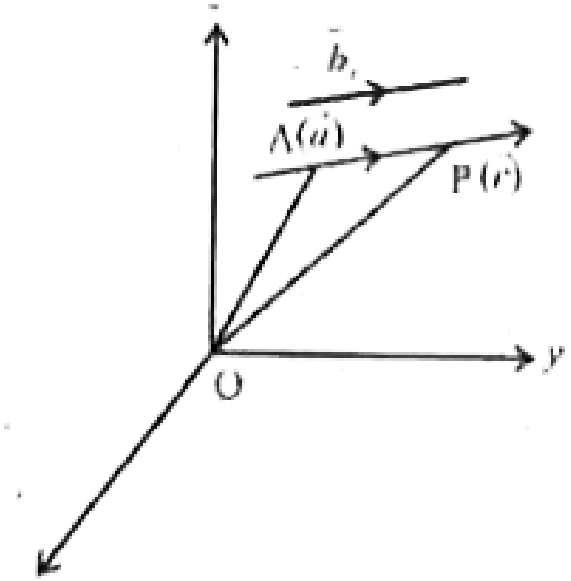
9. Derive the equation of a line in space passing through a given point and parallel to a given vector in both Vector an Cartesian

form.



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10. A person buys a lottery ticket in 50 lotteries, in ech of which his chance of winning a prize is 1/100. What is the probability that he will a prize (a) exactly once (b) atleast once ?

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Part E

1. Evaluate $\int_{-1}^{1} \sin^5 x \cos^4 x dx.$

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2. Show that $\begin{vmatrix} x+4 & 2x & 2x \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{vmatrix} = (5x+4)(4-x)^2$

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3. (a)Maximise z = 4x + y

subject to constraints :

$x + y \leq 50$

$3x + y \leq 90$

$x \geq 0$

$y \geq 0$

by graphical method.

(b) Find the value of K, if f(x) = $\begin{cases} Kx+1 & \text{if} x \leq \pi \\ \cos x & \text{if } x > \pi \end{cases}$ is continuous at x = π.

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4. Find the value of k.

If f(x) = $\begin{cases} kx+1, \text{if } x \leq \pi \\ \cos x, \quad \text{if } x > \pi \end{cases}$ is continuous at $x = \pi$.

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