MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

PUC SUPPLEMENTARY EXAMINATION QUESTION PAPER JUNE 2019

Part A

1. Let * be a binary operation on N defined by $a * b = LCM$ of a and b. Find $20 * 16$.

2. Find the principal value of $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

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3. If $A=[a_{ij}]$, where elements are given by $a_{ij}=\frac{1}{2}|-3j+j|$ construct 2×2 matrix.

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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. If $y = \cos^{-1}(\sin x)$ find $\frac{dy}{dx}$.

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6. $\int \sec^2(7 - 4x)dx$.

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7. If $\hat{a} = \frac{1}{\sqrt{14}}\left(2\hat{i} + 3\hat{j} + \hat{k}\right)$ then write the direction cosines of $\hat{a}$.

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8. Find the intercepts cut-off by the plane $2x + y - z = 5$.

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9. Define feasible region in a linear programming Problem.

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

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Part B

1. Find gof and fog given $f(x) = 8x^3$ and $g(x) = x^{1/3}$.

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2. Prove the following:

$$\tan^{-1}\frac{2}{11} + \tan^{-1}\frac{7}{14} = \tan^{-1}\frac{1}{2}$$

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3. Write $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right), x > 1,$ in the simplest form.

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4. Find the area of the triangle with vertices, (3,8), (-4,2) and (5,1) using determinants.

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5. Find $\frac{dy}{dx}$ given $x^2 + xy + y^2 = 100.$

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6. Differentiate $(\log_e x)\cos x$ with respect to x.

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7. Find the interval in which the function f given by $f(x) = 2x^2 - 3x$ is strictly increasing.

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8. Find $\int \frac{(x^4 - 1)^{\frac{1}{4}}}{x^5} dx.$

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9. Integrate $x \sec^2 x$with respect to x.

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

$y^{'''} + y^2 + e^{y'} = 0.$

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11. If $\vec{a}$ is a unit vector and $(\vec{x} - \vec{a}).(\vec{x} + \vec{a}) = 8,$ then find $|\vec{x}|$.

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12. Find the area of the parallelogram whose adjacent sides are given by the vectors $\vec{a} = 3\hat{i} + \hat{j} + 4\hat{k}$ and $b = \hat{i} - \hat{j} + \hat{k}$.

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13. Find the angle between the pair of lines $\frac{x+3}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ and $\frac{x+1}{1} = \frac{y-4}{1} = \frac{z-5}{2}$

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14. The probability distribution of random variable X is as follows:

X	0	1	2
P(X)	$\frac{188}{221}$	$\frac{32}{221}$	$\frac{1}{221}$

. Find expectation of X.

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Part C

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

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

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3. By using the elementary transformation, find the inverse of the matrix, $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$.

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

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5. Verify Rolle's theorem for the function $f(x) = x^2 - 4x - 3$, in the interval [1,4].

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6. Find the point at which the tangent to the curve $y = \sqrt{4x - 3} - 1$ has its slope $\frac{2}{3}$.

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7. Evaluate: $\int \frac{x}{(x+1)(x+2)} dx$

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8. Evaluate $\int_0^2 (x^2+1)$dx as a limit of a sum.

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

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10. If $y = ae^{3x} + be^{-2x}$ represents family of curves, where a and b are arbitrary constant. Form the differential equation.

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11. Show that the position vector of the point P, which divides the line joining the points A and B having position vectors $\vec{a}$ and $\vec{b}$ internally in the ratio $m:n$ is $\frac{m\vec{b}+n\vec{a}}{m+n}$

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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 shortest distance betweenn the lines.

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

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

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14. Bag I contains 3 red and 4 black balls. While Bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from Bag II.

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Part D

1. Prove that the funciton $f: R \rightarrow R$ defined by f(x)=4x+3

is invertible and find the inverse of f.

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2. If

$$A = \begin{bmatrix} 0 & 6 & 7 \\ -6 & 0 & 8 \\ 7 & -8 & 0 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}, C = \begin{bmatrix} 2 \\ -2 \\ 3 \end{bmatrix}$$

calculate AC, BC and (A+B)C.

Also verify (A+B)C=AC+BC

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

$3x - 2y + 3z + 8, 2x + y - z = 1, 4x - 3y + 2z = 4$

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4. If y=3 cos(log x)+4 sin(log x), show that $x^2 y_2 + x y_1 + y = 0$

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

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6. Find the integral of $\sqrt{x^2 + a^2}$ with respect to x and hence find $\int \sqrt{x^2 + 2x + 5dx}$.

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7. Find the area of the region in the first quadrant method enclosed by the x-axis, the line y=x and the circle $x^2 + y^2 = 32$.

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8. Find the general solution of the differential equation

$$(x+y)\frac{dy}{dx}=1.$$

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9. Derive the equation of a plane in normal form both in the vector and Cartesian form .

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10. A die is thrown 6 times. If getting an odd number is success, What is the probability

(a) 5 successes

(b) at least 5 successes

(c) at most 5 successes

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Part E

1. Prove that $\int_a^b (x)dx = \int_a^b f(a+b-x)dx$ and $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan x}}$.

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2. Determine the value of k, if

$$f(x) = \begin{cases} \dfrac{k \cos x}{\pi - 2x} & \text{if } x \neq \dfrac{\pi}{2} \\ 3 & \text{if } x = \dfrac{\pi}{2} \end{cases}$$

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3. A factor manufactures two types of screws, A and B. Each type of screw requires the use of two machines, an automatic and a hand operated. It takes 4 minutes on the automatic and 6 minutes on hand operated machines to maufacture a package of screw s A, while it take 6 minutes on automatic and 3 minutes on the hand operated machines to maufacture a package of screws B. Each machine is available for at the most 4 hours on any day. The manufacturer can sell a package of screws A at a profit of Rs. 7 and screws B at a profit of Rs 10. Assuming that he can sell all the screw he manufactures, how many packages of each type should the factory owner produced day in order to maximise his profit? Determine the maximum profit.

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4. Prove that $\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = \left(1 - x^3\right)^2.$

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