MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

ANNUAL EXAMINATION QUESTION PAPER MARCH - 2017

Part A

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

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2. Find the principal value of $\operatorname{cosec}^{-1}(-\sqrt{2})$.

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3. Construct a 2×2 matrix, $A = [a_{ij}]$, whose elements are given by:

(ii) $a_{ij} = \frac{i}{j}$.

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4. If a square matrix with $|A| = 8$ then find the value of |A A'|`.

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5. If $y = \cos\sqrt{x}$, find $\frac{dy}{dx}$

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6. Find : $\int\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)dx.$

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7. Define colliner vectors.

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8. Find the direction cosines of a line which makes equal angles with the coordinate axes.

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9. Define feasible region.

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

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Part B

1. Prove the following:

$$\sin^{-1}\left(2x\sqrt{1-x^2}\right)=2\cos^{-1}x,\ -\frac{1}{\sqrt{2}}\leq x\leq\frac{1}{\sqrt{2}}$$

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2. If $\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2}\tan^{-1}x, x > 0$ find x

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3. Find the value of k,if area of triangle is 4 sq. units and vertices arw (k,0),(4,0) and(0,2) using determinant.

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4. If $ax + by^2 = \cos y$ find $\frac{dy}{dx}$.

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5. Verify Rolle's theorem for the function $f(x) = x^2 + 2x - 8, x \in [-4, 2]$.

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6. Find the approximate change in the valume of a cube of side x metres caused side by 3%.

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

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8. Evaulate $\int_0^{2/3} \frac{dx}{4+9x^2}$

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9. Find the position vectors of a point R which divides the line joining two points P and Q whose position vectors are $\hat{i}+2\hat{j}-\hat{k}-$ and $-\hat{i}+\hat{j}-\hat{k}$ respectively, in the ration $2:1$.

(i) Internally, (ii) Externally.

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10. Find the area of the parallelogram whose adjacent sides are determined by the vectors $\overrightarrow{a}=\hat{i}-\hat{j}+3\hat{k}$ and $\overrightarrow{b}=2\hat{i}-7\hat{j}+\hat{k}$

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11. Find the vector and the Cartesian equation of the line that passes through the points (3,-2,-5), (3,-2,6).

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12. Find the probability distribution of

number of heads in two tosses of a coin .

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Part C

1. Prove that the relation R defined on the set of real numbers R as $R = \{(a, b) : a \leq b^2 \forall a, b \in R\}$ is neither reflexive nor symmetric nor transitive.

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

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3. If A and B are symmetric matrices of the same order.then show that AB is symmetric if and only if AB=BA.

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

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5. Differentiate $\sin^2 x$ with respect to $e^{\cos x}$.

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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: $\int \frac{2x}{x^2 + 3x + 2} dx$.

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8. Find : $\int e^x \sin x dx$.

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

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10. Form the differential equation of the family of circles having centre on y-axis and radius 3 units.

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

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12. Three vectors $\bar{a}, \bar{b}$ and $\bar{c}$ satisfy the condition $\vec{a} + \vec{b} + \vec{c} = \vec{0}$

evaluate

$\mu = \vec{a} . \vec{b} + \vec{b} . \vec{c} + \vec{c} . \vec{a}$ if $\left|\vec{a}\right| = 1, \left|\vec{b}\right| = 4$ and $\left|\vec{c}\right| = 2$

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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. Given that the two numbers appearing on throwing two dice are different . Find the probability of the events 'the sum of numbers on the dice is 4' .

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Part D

1. Let $f: N \to R$ be defined by $f(x) = 4x^2 + 12x + 15$, show that $f: N \to S$, where S is the range of f, is invertible. Also find the inverse.

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2. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 7A + 2I = 0$.

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3. Use the product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}\begin{bmatrix} -2 & -0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations

$x - y + 2z = 1$

$2y - 3z = 1$

$3x - 2y + 4z = 2$

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4. If $y = \left(\tan^{-1} x\right)^2$ then show that $\left(x^2 + 1\right)^2 \frac{d^2y}{dx^2} + 2x\left(x^2 + 1\right)\frac{dy}{dx} = 2$

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5. The length x of rectangle is decreasing at the rate of 5cm/minute and width y is increasing at the rate of 4 cm/minute. When x=8 cm and y=6 cm, find the rate of change of (i) the perimeter and (ii) the Area of the rectangle.

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

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7. Derive the equation of a plane perpendicular to a given vector and passing through a given point in both vector form and Cartesian form.

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Part E

1. Prove that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$ and hence evaluate the following:

(b) $\int_0^{\frac{\pi}{2}} \cos^2 x dx.$

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2. Prove that

$$\begin{vmatrix} x & x^2 & yz \\ y & y^2 & zx \\ z & z^2 & xy \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx).$$

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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. Determine the value of k, if $f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x} & \text{if } x \neq \frac{\pi}{2} \\ 3 & \text{if } x = \frac{\pi}{2} \end{cases}$

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