# MATHS

## BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

## ANNUAL EXAM QUESTION PAPER MARCH 2016

### Part A

**1.** Find $\int \cos ecx(\cos ecx + \cot x)dx.$

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**2.** Find a value of x for which $x\left(\hat{i} + \hat{j} + \hat{k}\right)$ is a unit vector.

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**3.** If $y=(\log)^{\cos x}$ find $\frac{dy}{dx}$.

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**4.** $\cos\left(\sec^{-1}x+\cos ec^{-1}x\right),\ |x|\geq 1$

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**5.** If vector $\overline{AB}=2\hat{i}-\hat{j}+\hat{k}$ and $\overline{OB}=3\hat{i}-4\hat{j}+4\hat{k}$, find the position vector $\overline{OA}$

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**6.** Find the distance of the point (-6, 0, 0) from the plane 2x - 3y + 6z = 2.

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**7.** If $\begin{bmatrix} x+2 & y-3 \\ 0 & 4 \end{bmatrix}$ is a scalar matrix. Find x and y.

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**8.** If $P(A) = 0.8 \text{ and } P(B/A) = 0.4$ then find $P(A \cap B)$

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**9.** The operation * defined $a * b = a$. Is * a binary operation on z.

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**10.** Define feasible region in a linear programming Problem.

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## Part B

**1.** Write the simplest form of $\tan^{-1}\left[\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right]$, if $\frac{a}{b}\tan x >$ -1.

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**2.** Using determinants show that points A(a, b + c), B(b, c + a) and C(c, a + b) are collinear.

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**3.** If functions $f: R - > R$ and $g: R - > R$ arc given by $f(x) = |x|$ and $g(x) = |x|$, (where $|A|$ is indicatescates: integer function) find $fog\left(\left|-\frac{1}{2}\right|\right)$ and go $f\left(-\frac{1}{2}\right)$.

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**4.** 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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**5.** Find $\frac{dy}{dx}$, $\quad$ if $\quad y = x^{\sin x}, x > 0.$

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**6.** If $x^y = a^x$,prove that $\frac{dy}{dx} = x \log_e a - \frac{y}{x} \log_e x.$

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**7.** find $\int \frac{1}{\sin x \cos^3 x}$dx.

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**8.** Using differentials, find the approximate value of each of the following upto 3 place of decimal.

(i) $\sqrt{25.3}$

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**9.** 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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**10.** If $\left|\vec{a} + \vec{b}\right| = \left|\vec{a} - \vec{b}\right|$ prove that a and b are perpendicular.

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**11.** Find angle between the vectors $\vec{a} = \vec{i} + \hat{j} - \hat{k}$ and $\vec{b} = \hat{i} + \hat{j} + \hat{k}$.

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**12.** The random variable X has a probability distribution P(X) of the following form, where K is some number $P(X) = \begin{cases} K & \text{if x} = 0 \\ 2K & \text{if x} = 1 \\ 3K & \text{if x} = 2 \\ 0 & \text{otherwise} \end{cases}$

(a) Determine the value of K.

(b) Find $P(X < 2)$.

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**13.** The random variable X has a probability distribution P(X) of the following form, where K is some number $P(X) = \begin{cases} K & \text{if x} = 0 \\ 2K & \text{if x} = 1 \\ 3K & \text{if x} = 2 \\ 0 & \text{otherwise} \end{cases}$

(a) Determine the value of K.

(b) Find $P(X < 2)$.

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## Part C

**1.** Using elementary transformations, find the inverse of the matrices

$$\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$$

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**2.** Show that the relation R in the set $A = \{x \in z, 0 \leq x \leq 12\}$ given by

$R = \{(a, b) : |a - b|$ is a multiple of 4} is an equivalence relation.

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**3.** Verify Mean Value Theorem if$(x) = x^3$ - $5x^2$ - 3xin the interval [1, 3].

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**4.** If $x = a\cos^3 0$ and $y = a\sin^3 = 0$, prove that $\frac{dy}{dx} = -\sqrt[3]{\frac{y}{x}}$.

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**5.** Box I contains 2 gold coins, while another Box-Il contains I gold and 1 silver coin. A person chooses a box at random and takes out a coin. If the coin is gold, what is the probability that the other coin in the box is also of gold?

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

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

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**8.** Find two numbers whose product is 100 and whose sum is minimum.

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**9.** Find area lying between the curves $y^2 = 4x$ and $y = 2x$ is

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**10.** Find the distance between the parallel lines $\vec{r} = \hat{i} + 2\hat{j} - 4\hat{k} + m\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right)$ and $\vec{r} = 3\hat{i} + 3\hat{j} - 5\hat{k} + n\left(2\hat{i} +$

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**11.** Find angle between the vectors $\vec{a} = \vec{i} + \hat{j} - \hat{k}$ and $\vec{b} = \hat{i} + \hat{j} + \hat{k}$.

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**12.** Find the equation of the curve passing through the point $(1, 1)$, given that the slope of the tangent to the curve at any point is $\frac{x}{y}$

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## Part D

**1.** If $A = \begin{bmatrix} 1 \\ 4 \\ 5 \end{bmatrix}$ and $B = [1 \quad 3 \quad 6]$ verify that $(AB)^{'} = B^{'}A^{'}$.

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**2.** 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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**3.** The length x of a rectangle is decreasing at the rate of 3 cm/min and the width y is increasing at the rate of 2cm/min. When x=10cm and y=6cm, find the ration of change (i) the perimeter and (ii) the area of the reactangle.

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**4.** If $y = (\sin^{-1} x)$. Show that $(1 - x^2)\frac{d^2y}{dx^2} - x\left(\frac{dy}{dx}\right) = 0$

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**5.** Find the integral of $\frac{1}{x^2 + a^2}$ w.r.t.x and hence evaluate $\int \frac{1}{x^2 + 2x + 3}$ dx.

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**6.** Using integration find the area of region bounded by the triangle whose vertices are (1, 0), (2, 2) and (3, 1).

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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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**8.** The probability that a student is not a swimmer is $\frac{1}{5}$. Find the probability that out of 5 students.

at most three are swimmers.

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**9.** Solve the differential equation ydx + (x - $ye^y$)dy=0

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**10.** Maximize and Minimize $Z = 5x + 10y$, subject to constraints are

$x + 2y \leq 120, x + y \geq 60, x - 2y \geq 0 \text{ and } x, y \geq 0.$

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