MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

SUPER MODEL QUESTION PAPER FOR PRACTICE

Part A

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

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2. Simplify the following:

$\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$

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3. Define a skew-symmetric 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. Find the derivative of $\sqrt{e^{\sqrt{x}}}w.r.t.\ 'x.$

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

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7. If the vectors $2\hat{i} + 3\hat{j} - 6\hat{k}$ and $4\hat{i} - m\hat{j} - 12\hat{k}$ are parallel, find m.

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

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9. Define optimal solution in linear programming problem.

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10. Let x, represents the difference between number of heads and the number of tails obtained when a coin is tossed 6 times. What are posible values of x?

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Part B

1. Define a transitive relation.

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2. Prove the following:

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

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3. Simplify the following:

$$\sin^{-1}\left(\sin\frac{3\pi}{5}\right)$$

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

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5. Examine the continuity of the function $f(x) = 2x^2 - 1$ at x=3.

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6. If $y = 5\cos x - 3\sin x$, Prove that $\frac{d^2y}{dx^2} + y = 0$.

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7. If the radius of a sphere is measured as 9 cm. With an error, 0.03 cm., then find the approximate error in calculating its volume.

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8. Evaluate : $\int \frac{1}{\cos^2 x(1-\tan x)^2} dx.$

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9. Evaluate : $\int \frac{e^x(x-1)}{x^2} dx.$

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10. Find the order and degree of the differential equation, $xy, \frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 - y\frac{dy}{dx} = 0.$

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11. Find the unit vector in the direction of thd sum of the vectors $2\hat{i} + 2\hat{j} + 5\hat{k}$ and $2\hat{i} + \hat{j} - 3\hat{k}.$

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12. Find the volume of the parallelopiped whose terminal edges are $\hat{i} - 2\hat{j} + \hat{k}, 2\hat{i} - 3\hat{j} + \hat{k}$ and $3\hat{i} + \hat{j} - 2\hat{k}$.

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13. Find the cartesian equation of line which passes through the point (1,2,3) and is parallel to the vector $3\hat{i} + 2\hat{j} - \hat{2}k$.

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Part C

1. Given that the events A and B are such that $P(A) = \frac{1}{2}$, and $P(A \cup B) = \frac{3}{5}P(B) = P$. Find P if they are independent.

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2. Verify whether the binary operation * on Q, the set of all rationals, defined as a*b=ab+1 is commutative or associative.

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3. Show that $\tan^{-1}\left[\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right] = \tan^{-1}\left(\frac{a}{b}\right) - x$ when $\frac{a}{b}\tan^{-1} x > -1$.

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4. Express $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ as sum of a symmetric and skew symmetric matrices.

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5. If $y = x^x - 2^{\sin x}$ find $\frac{dy}{dx}$.

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6. If $y = \tan^{-1}\left(\frac{1+\sin x}{\cos x}\right)$ shoe that $\frac{dy}{dx} = \frac{1}{2}$.

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7. Find the intervals in which the functions f given by $f(x) = 4x^3 - 6x^2 - 72x + 30$ is

(a) strictly increasing (b) strictly decreasing.

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9. Evaluate : $\int_{-5}^{5} |x-2| dx.$

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10. Evaluate: $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx.$

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

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12. From the differential equation representing the family of parabolas having vertex at origion and axis along possitive direction of x-axis.

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13. Find the area of a triangle having the points A(1,1,1)B(1,2,3) and C(2,3,1) as its vertices.

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14. 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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15. Find the vector and cartesian equations of the plane that passes through the points (1,4,6) and the normal vector to the plane is $\hat{i}-2\hat{j}+\hat{k}$.

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16. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

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Part D

1. $f: R \to R$ be defined as $f(x) = 4x + 5 \forall x \in R$ show that f is invertible and find f^{-1}.

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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 $e^y(x+1) = 1$ show that $\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2$.

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5. A man of height 2 metres walks at a uniform speed of 5 km/h away from a lamp post which is 6 metres high. Find the rate at which the length of his shadow increases.

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6. Find the integral of $\frac{1}{\sqrt{x^2 - a^2}}$ with respect to x and hence evaluate $\frac{1}{\sqrt{x^2 + 4x - 10}} dx.$

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7. Find the area lying above x-axis and included between the circle $x^2 + y^2 = 8x$ and inside of the parabola $y^2 = 4x.$

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8. Solve the differential equation $x \log x \frac{dy}{dx} + y = \frac{2}{x} \log x.$

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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. If a fair coin is tossed 8 times. Find the probability of

at least five heads.

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11. If a fair coin is tossed 8 times. Find the probability of

at most five heads.

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Part E

1. Prove that $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$ hence evaluate $\int_0^{\frac{\pi}{4}} \log(1+\tan x)dx$

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

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3. There are two types of fertilizers F_1 and F_2 consists of 10% nitrogen and 6% phosphoric acid and F_2 consists of 5% nitrogen and 10% phosphoric acid. After testing the soil conditions, a farmer finds that he needs atleast 14 kg of nitrogen and 14 kg of phosphoric acid for his crop. If F_1 costs Rs. 6/kg and F_2 costs Rs. 5 kg. Determine how much of each type fertilizer should be used so theat nutrient requirements are met at a minimum cost. What is the minimum cost? Also show graphically.

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4. Find the Continuity of function $f(x)$.

$$f(x) = \begin{cases} |x| + 3 & \text{if} \quad x \leq -3 \\ -2x & \text{if} \quad -3 < x < 3 \\ 6x + 2 & \text{if} \quad x \geq 3 \end{cases}$$

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