MATHS

BOOKS - JEEVITH PUBLICATIONS

MATHS (KANNADA ENGLISH)

MODEL QUESTION PAPER 4

Part A

1. State with reason whether following functions have inverse

(i) $f: \{1, 2, 3, 4\} \to \{10\}$ with

$f = \{(1, 10), (2, 10), (3, 10), (4, 10)\}$

(ii)$g: \{5, 6, 7, 8\} \to \{1, 2, 3, 4\}$ with

$g = \{(5, 4), (6, 3), (7, 4), (8, 2)\}$

(iii) $h: \{2, 3, 4, 5\} \to \{7, 9, 11, 13\}$ with

$h = \{(2, 7), (3, 9), (4, 11), (5, 13)\}$

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2. Find |3A| if $A = \begin{bmatrix} 4 & -1 \\ 3 & 2 \end{bmatrix}$.

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3. Simplify the following:

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

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4. The greatest integer function a not differentiable at integral points give reason.

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5. Construct a 2×2 matrix $A = [a_y]$ where $a_y = \frac{i-j}{2}$

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6. Evaluate : $\int \sin(2+5x)dx$

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7. If $\vec{a}$ is a non-zero vector of magnitude a and $\vec{\lambda a}$ a is a unit vector, find the value of λ

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8. Find the distance of the plane $2x-3y+4z-6=0$ from the origin

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9. Define the term ' constrains' in a LPP .

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10.

X	0	1	2	3	4
$P(X)$	0.1	0.5	0.2	−0.1	0.3

given is not a probability distribution why ?

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Part B

1. A binary operation ^ on the set {1,2,3,4,5} defined by a^b=min(a,b), write the operation table for operations ^.

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2. Prove that $2\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{7}=\tan^{-1}\frac{31}{17}$

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3. Solve $2\tan^{-1}(\cos x)=\tan^{-1}(2\cos ecx)$

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4. Find the area of triangle whose vertices are (2,0), (-1,0) and (0,3) by using determinants

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5. Find $\frac{dy}{dx}$, if $2x + 3y = \sin y$

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6. Diffentiate $x^{\sin t}$, $x > 0$ w.r.t. x

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7. Find the local maximum value of the function $g(x) = x^3 - 3x$

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8. Evaluate : $\int \frac{\cos 2x + 2\sin^2 x}{\cos^2 x} dx$

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9. Evaluate : $\int \frac{dx}{x^2 - 6x + 13}$

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10. Find the order and degree of the differential equation

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

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11. Show that

$$\left(\vec{a} - \vec{b}\right) \times \left(\vec{a} + \vec{b}\right) = 2\left(\vec{a} \times \vec{b}\right).$$

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12. Find $\left|\vec{a}\right|$ and $\left|\vec{b}\right|$, if $\left(\vec{a}+\vec{b}\right).\left(\vec{a}-\vec{b}\right)=8$ and $\left|\vec{a}\right|=8\left|\vec{b}\right|$.

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13. Find the equation of the plane passing through the line of intersection of the planes .x+ y+ z = 6 and 2x+ 3y+ 4z-5 = 0 and the point (1,1,1).

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14. Assume that each child born is equally likely to be boy or a girl . If a family has two children, what is the conditional probability that both are girls given that

atleast one is a girls ?

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Part C

1. 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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2. Express $\tan^{-1}\left(\frac{\cos x}{1 - \sin x}\right), -\frac{3\pi}{2} < x < \frac{\pi}{2}$ in the simplest form.

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3. Find the value of x and y in $\begin{bmatrix} x+2y & 2 \\ 4 & x+y \end{bmatrix} - \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix} = 0$ where 0 is a null matrix.

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4. If $x = \sqrt{a^{\sin^{-1} t}}$ then prove that $\frac{dy}{dx} = \frac{-y}{x}$

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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. $y = x^4 - 6x^3 + 13x^2 - 10x + 5$ at (0,5).

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7. Integrate : $\frac{\sin x}{\sin(a + x)}$ with respect to x

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8. Evaluate $\int_1^b (x+1)dx$ as a limit of 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. Find the equation of a curve passing through the point (-2,3), given that slope of the tangent to the curve at any point (x,y) is $\frac{2x}{y^2}$

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11. Find the area of the triangle with vertices A(1,1,2), B(2,3,5) and C(1,5,5).

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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 angle between the line $\frac{x+1}{2}=\frac{y}{3}=\frac{z-3}{6}$ and the plane $10x+2y-11z=0.$

Note : The angle between a line and a plane is the complement of the angle between $\vec{b}$ and $\vec{a}$

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14. Two groups are competing for the position on the board of directors of a corporation. The probability that the first and the second groups will win are 0.6 and 0.4, respectively. Further, if the first group wins the probability of introducing anew product is 0.7 and the corresponding probability is 0.3 if the second group wins. Find the probability the the new product introduce was by the second group .

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Part D

1. Prove that the funciton $f: R \to R$ defined by f(x)=4x+3 is invertible and find the inverse of f.

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2. If $A = \begin{pmatrix} 2 & 3 & 4 \\ 0 & -2 & 1 \\ 3 & -1 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 0 & -3 \\ 4 & 0 & -1 \\ 3 & 4 & 5 \end{pmatrix}$ and $C = \begin{pmatrix} 5 & 6 & 7 \\ -1 & 2 & 3 \\ 4 & -5 & 4 \end{pmatrix}$

Prove that A(BC)=(AB)C

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

$2x + y + 2z = 5$

$x - y - z = 0$

$x + 2y + 3z = 5$

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4. If y=5cos(logx)+7sin(logx) show that $x^2y_2 + xy_1 = 0$

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5. Find the integral of $\frac{1}{x^2 - a^2}$ with respect to x and evaluate $\int \frac{dx}{x^2 - 8x + 5}$

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6. Sand is pouring 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 base. How fast height of the sand cone increasing when the height is 4 cm?

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7. Find the area of the region bounded by the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$.

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8. Find the particular solution of the differential equations

$\frac{dy}{dx} + y\cot x = 4\cos ecxx = 0$ given that y=0 when $x = \frac{\pi}{2}$

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9. Derive the equation of a line in space passing through two given plots both in vector and Cartesian form.

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10. Five cards are drawn successively with replacement from a well shuffled deck of 52 cards. What is the probability that

(i) all the five cards are spades?

only five three cards are spaces?

(iii) none of spades?

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Part E

1. Five cards are drawn successively with replacement from a well shuffled deck of 52 cards. What is the probability that

(i) all the five cards are spades?

only five three cards are spaces?

(iii) none of spades?

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2. Solve the following problem graphically

Minimise and Maximise

z=3x+9y

Subject to the constraints:

$x + 3y \leq 60, x + y \geq 10, x \leq yx \geq 0, y \geq 0$

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3. Prove that

$$\int_{-a}^{a} dx = \begin{cases} 2\int_0^a f(x)dx & \text{if } f(x)\text{is even} \\ 0 & \text{if } f(x)\text{is odd} \end{cases}$$

and hence evaluate

(a) $\int_{-1}^{1} \sin^5 x \cos^4 x dx.$

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