MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

MODEL QUESTION PAPER 5

Part A

1. Give an example of a relation which is reflexive and symmetric but not transitive.

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2. $\cot\left(\tan^{-1} a + \cot^{-1} a\right)$

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3. Define a scalar matrix.

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4. If $\begin{vmatrix} x & 8 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 2 & 8 \\ 8 & 2 \end{vmatrix}$ find the value of x.

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5. Differentiate $\sin\sqrt{x}$ with respect to x.

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6. Evaluate : $\int \frac{1-x}{\sqrt{x}} dx$

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7. Find the vector components of the vector with initial point (2,1) and terminal point (-5,7).

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8. What is the equation of the plane that cuts the coordinate axes at (a,0,0), (0,b,0) and (0,0,c) ?

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9. Define the term corner point of a feasible region in an LPP.

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10. If E is an event ofa sample space S of a experiment then find P(S/F)

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Part B

1. Verify whether the operation * defined on Q by a*b $= \frac{ab}{4}$ is associated or not.

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2. Simplify the following:

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

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

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4. Let A (1,3), B(0,0) and C(k,0) be the vertices of triangle ABC of area 3sq. Units find k using determinantd method.

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5. Prove that the greatest integer function $f: R \to R$ defined by $f(x) = [x]$, where [x] indicates the greatest integer not greater than x, is neither one-one nor onto.

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6. $x = 4t, y = \frac{4}{t}$ then find $\frac{dy}{dx}$

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7. Find the intervals in which the function f given by $f(x) = x^2 - 4x + 6$ is (a) strictly increasing (b) strictly decreasing.

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8. Evaluate : $\int \sin 3x \cos 4x dx$

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9. Evaluate : $\int \log x dx$

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10. Form the differential equation of the family of curves $\frac{x}{a} + \frac{y}{b} = 1$ by eliminating the constants 'a' and 'b'

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11. If either $a = 0, b = 0$, then a.b=0. But the converse need not to be true . Justify your answer with an example.

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

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13. 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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14. A fair die is rolled . Consider events E = {1, 3, 5} F = {2, 3} and G = {2, 3, 4, 5} . Find

$P(E/F)$ and $P(F/E)$

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Part C

1. Determine whether the relation R in the set A = {1,2,3,4,5,6} as R = {(x,y) : y is divisible by x} is reflexive, symmetric and transitive.

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2. If $\tan^{-1}\frac{x-1}{x-2}+\tan^{-1}\frac{x+1}{x+2}=\frac{\pi}{4}$, find x

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3. Find the value of x and y : $\begin{bmatrix} x+y & 3 \\ x-y & -6 \end{bmatrix}=\begin{bmatrix} 2 & 3 \\ 4 & -6 \end{bmatrix}$

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4. If $y^x+x^y=a^b$ find $\frac{dy}{dx}$

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5. Verify Mean value theorem for the function $f(x) = x^3 - 5x^3 - 3x$ in the interval [a,b]

Where a=1 and b=3 Find all $c \in (1, 3)$ For which f'(c)=0

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6. Find two positive numbers whose sum is 16 and the sum of whose cubes is minimum.

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

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8. Evaluate : $\int \frac{1}{1+\tan x} dx$

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

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10. Prove that the equation $x62\frac{dy}{dx} = x^2 - 2y^2 + xy$ is a homogenous differential equation

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11. Find a vector perpendicular to each of the vectors $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$, $\vec{b} = 3\hat{i} + 5\hat{j} - 2\hat{k}$, which has magnitude 10 units

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12. Show that the points A(-1,4,-3), B(3,2,-5) C(- 3,8,-5) and D (-3,2,1) are coplanar

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13. 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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14. A die is thrown. If E is the event 'the number appearing is a multiple of 3' and F is the event 'the number appearing is even', then find whether E and F are independent?

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Part D

1. If $f: A \to A$ defined by $f(x) = \frac{4x+3}{6x-4}$ where $A = R - \left\{\frac{2}{3}\right\}$, show that f is invertible and $f^{-1} = f$.

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

$x + 2y + 3z = 2$

$2x + 3y + z = -1$

$x - y - z = -2$

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3. 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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4. A particle move along the curve $6y = x^3 + 2$ .Find the points on the curve at which y-coordinate is changing 8 times as fast as the x-coordinates.

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5. Find the integral of $\frac{1}{\sqrt{a^2 - x^2}}$ with respect to x, and hence evalute $\int \frac{dx}{\sqrt{5 - 4x - x^2}}$

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6. The area bounded by the circle $x^2 + y^2 = 2$ is equal to :

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7. Find the general solution of the differential equation $\frac{dy}{dx} + y.\cot x = 2x + x^2 \cot x$

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8. Derive the formula for the distance between two parallel lines $\vec{r} = \vec{a_1} + \lambda \vec{b}$ and $\vec{r} = \vec{a_2} + \mu \vec{b}$ in vector form.

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

at most five heads.

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Part E

1. A manufacturer produces nuts and bolts . It takes 1 hr of work on machine A and 3 hr on machine B to produce a package of nuts and bolts . He earns a profit of Rs 17.50 per package on nuts and Rs 7.00 per

package on bolts . How many package of each should be produced each most 12 h a day to maximize the profit?

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2. 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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3. Find all the points of discontinuity on f defined by f(x)=|x|-|x+1|

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