MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

MODEL QUESTION PAPER 1

Part A

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

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2. Write the range of the principal value branch of the function $y = \sin^{-1} x$

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3. Define a diagonal matrix.

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4. If A=$\begin{bmatrix} 4 & 6 \\ 7 & 6 \end{bmatrix}$ find |3A|

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5. Write the points of discontinuity for the function $f(x) = [x],\ -3 < x < 3$

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6. Evalute $\int$ cos ecx(cos ecs-cot x)dx

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7. find the direction ratios of the vector, joining the points $P(2, 3, 0)$ and Q(-1,-2,-3)` direction from P to Q.

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8. Find the equation of the plane with the intercept 2,3 and 4 on x,y and z axes respectively.

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9. Define optimal solution in linear programming problem.

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10. Let A and B be independent events with P(A) = 0 . 3 and P(B) = 0 . 4, . Find

$P(A \cap B)$

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Part B

1. Find gof and fog given $f(x) = 8x^3$ and $g(x) = x^{1/3}$.

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2. Write the following in the simplest form of $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right), 0 < x < \frac{\pi}{2}$

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3. Prove that $2\sin^{-1}\left(\frac{3}{5}\right) = \tan^{-1}\left(\frac{24}{1}\right)$

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4. Find the area of a triangle whose vertices are (1,3), (2,5) and (7,5) using determinants

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

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6. If $x = at^2$, y=2at show that $\frac{dy}{dx} = \frac{1}{t}$

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7. Find the approximate change in the volume V of a cube of side x meters caused by increasing side by 2%.

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8. Evalute: $\int \sin^3 x dx$

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9. $\int_0^{\pi/2} \cos 2x dx.$

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10. Find the order and degree of the differential equation, $\left(\frac{ds}{dt}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$

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11. Find a vector in the direction of the vector $\vec{a} = 2\hat{i} + 3\hat{j} + \hat{k}$ that has magnitude 7 units.

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12. If $\widehat{a} = 5\hat{i} - \hat{j} - 3\widehat{K}$ and $\overrightarrow{b} = \hat{i} + 3\hat{j} - 5\hat{k}$, then show that the vectors $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$ are perpendicular.

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13. Find the vector equation of the line, passing through the points (-1,0,2) and (3,4,6)

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14. Two coins are tossed once, where

E : no tail appears $\quad$ F : no head appears

Find $P(E/F)$

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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. Prove that $\tan^{-1} x + \tan^{-1} \frac{2x}{1 - x^2} = \tan^{-1} \left[\frac{3x = x^3}{1 - 3x^2} \right], |x| < \frac{1}{\sqrt{3}}$

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3. Find the values of x, y and z in the following matrices. $\begin{pmatrix} x+y & 2 \\ 5+z & xy \end{pmatrix} = \begin{pmatrix} 6 & 2 \\ 5 & 8 \end{pmatrix}$

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4. Differentiate $\sqrt{\frac{(x-1)(x-2)}{(x-3)(x-4)}}$ with respect to x

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5. If $y = \sin^{-1}\left[\frac{2^{x+1}}{1+4^x}\right]$ find $\frac{dy}{dx}$.

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6. Find the intervals in which the function f given by $f(x) = 2x^3 - 3x^2 - 36x + 7$ is

(a) strictly increasing (b) strictly decreasing?

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

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8. Evaluate $\int \frac{x \cos^{-1} x}{\sqrt{1-x^2}} dx$

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9. Find the area between the curves $y = x^2$ and $y = x$

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10. Form the differential equation representing the family of curves $y = a\sin(x + b)$ where a,b are arbitrary constant.

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11. 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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12. Prove that $\left[\vec{a}, \vec{b}, \vec{c} + \vec{d}\right] = \left[\vec{a}, \vec{b}, \vec{c}\right] + \left[\vec{a}, \vec{b}, \vec{d}\right]$.

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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. Two cards are drawn successfully with replacement from a well-shuffled pack of 52 cards. Find the probability distribution of number of aces.

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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. Verify (A+B)C=AC+BC

if $A=\begin{pmatrix}0 & 6 & 7\\ -6 & 0 & 8\\ 7 & -8 & 0\end{pmatrix}$, $B=\begin{pmatrix}0 & 1 & 1\\ 1 & 0 & 2\\ 1 & 2 & 0\end{pmatrix}$ and $C=\begin{pmatrix}2\\ -2\\ 3\end{pmatrix}$

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

x-y+2z=7

3x+4y-5z=-5

2x-y+3z=12

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4. Find the integral of $\sqrt{x^2+a^2}$ w.r.t. x and hence evaluate $\int\sqrt{x^2+4x+6}$, dx.

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

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

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7. Find the general solution of the differential equation $ydx - \left(x + 2y^2\right)dy = 0$

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8. 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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9. There are 5% defective items in a large bulk of items. What is the probability that a sample of 10 items will include not more than 1 defective item.

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Part E

1. Prove that $\int_0^{2a} f(x)dx = 2\int_0^a f(x)dx$ when $f(2a-x) = f(x)$ and hence evaluate $\int_0^{\pi} |\cos x| dx$.

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2. Minimize Z = 3x + 2y, subject to constraints are $x + 2y \leq 10, 3x + y \leq 15,$ and $x, y \geq 0$.

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3. Find the relationship between a and b so that the function defined by

$$f(x) = \begin{cases} ax + 1 & \text{if} \quad x \leq 3 \\ bx + 3 & \text{if} \quad x > 3 \end{cases}$$ is continuous at x = 3.

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