MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

ANNUAL EXAMINATION QUESTION PAPER MAR-2019

Part A

1. Define Binary Operation.

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2. Find the principal value of the following:

$$\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$$

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3. Define a scalar 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. $\sin\left(x^2+5\right)$

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6. $\int(1+x)\sqrt{x}dx.$

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

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8. If a line has direction ratios 2,-1,-2 then determine its direction cosines.

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9. Defione objective function in Linear Programming Problem.

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10. If P(E)=0.6, P(F)=0.3 $P(E \cap F) = 0.2$ then find $P(F/E)$.

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Part B

1. Show that the function $f: N \to N$ given by f(x)=2x is one-one but not onto.

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2. Prove that $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}, x \in [-1, 1]$

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3. Write $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right), x > 1$, in the simplest form.

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4. Find area of the triangle with vertices (2,7),(1,1),(10,8).

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5. Find $\frac{dy}{dx}$ if $y = (\log x)^{\cos x}$

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6. If $ax + by^2 = \cos y$ find $\frac{dy}{dx}$.

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

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9. Find $\int \sin 2x \cos 3x dx.$

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10. Find the order and degree, it defined of the differential equation $\frac{d^4y}{dx^4} + \frac{\sin(d^3y)}{dx^3} = 0$

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11. If $\left(\vec{a} + \vec{b}\right).\left(\vec{a} - \vec{b}\right) = 8$ and $\left|\vec{a}\right| = 8\left(\vec{b}\right)$ then find $\left|\vec{b}\right|$.

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12. Find the projection of the vector $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$

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13. Find the distance of the point (3,-2,1) from the plane 2x-y+2z+3=0.

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14. Probability of solving problem independently by A and B are respectively. If both try to solve the problem independently, find the probability the problem is solved.

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Part C

1. Check whether the relation R in IR of real numbers defined by $R = \{(a, b) : a < b^3\}$ is reflexive, symmetric or transitive.

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2. $\cos^{-1}\frac{4}{5} + \cos^{-1}\frac{12}{13} = \cos^{-1}\frac{33}{65}$

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3. By using elementary transformations, find the inverse of

$$A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$$

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4. If $x = a(\theta + \sin\theta), y = a(1 - \cos\theta)$ then show that

$$\frac{dy}{dx} = \tan\left(\frac{\theta}{2}\right)$$

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

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7. Find $\int x \log x dx$.

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8. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin x}{1 + \cos^2 x} dx$

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9. Find the area of the region bounded by the curve $y^2 = 4x$ and the line x=3.

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10. If $y = ae^{3x} + be^{-2x}$ represents family of curves, where a and b are arbitrary constant. Form the differential equation.

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11. Find a unit vector perpendicular to each of the vector $\left(\vec{a} + \vec{b}\right)$ and $\left(\vec{a} - \vec{b}\right)$, where $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$

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12. Show that the four points which position vectors. $4\hat{i}+8\hat{j}+12\hat{k}, 2\hat{i}+4\hat{j}+6\hat{k}, 3\hat{i}+5\hat{j}+4\hat{k}$ and $5\hat{i}+8\hat{j}+5\hat{k}$ are coplanar.

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13. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident is 0.01, 0.03 and 0.15 respectively. One of the insured person meets with an accident. What is the probability that he is a cooter driver?

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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 $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$ then show that $A^3 - 23A - 40I = 0$

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

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5. 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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6. Find the integral of $\frac{1}{x^2 - a^2}$ with respectto x and hence evaluate $\int \frac{1}{x^2 - 16} dx$

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7. Using the method of integration, find the smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line x+y=2.

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8. Find the general solution of the differential equation $\frac{dy}{dx} + (\sec x)y = \tan x, \left(0 \leq x \leq \frac{\pi}{2}\right).$

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9. Derive the equation of a line in space passing through a given pont and parallel to a given vector in both 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. Prove that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$ and hence evaluate $\int_0^{\frac{\pi}{2}} \frac{\cos^5 x}{\sin^5 + x + \cos^5 x} dx.$

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2. सिद्ध कीजिए कि

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + 1\right).$$

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3. Solve the following problem graphically:

Maximum and minimize

Z=10500x+9000y

Subject to the constraints

$x + y \leq 50$

$2x + y \leq 80$

$x \geq 0, y \geq 0$

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4. Find the value of K, if $f(x) = \begin{cases} Kx^2 & \text{if } x \leq 2 \\ 3 & \text{if } x > 2 \end{cases}$

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