MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

ANNUAL EXAMINATION QUESTION PAPER JUN-2018

Part A

1. The relation R on set A={1,2,3} is defined as R {(1,1),(2,2),(3,3),(1,2),(2,3)} is not transitivie. Why?

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2. Write the range of $y = \cos^{-1} x$.

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3. If a matrix has 5 elements what are the possilbe orders it can have?

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4. Find the values of x for which $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$

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5. Find $\frac{dy}{dx}$, if $y = \sin(ax + b)$

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

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7. Define negative of a vector.

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8. The Cartesian equation of a line is $\frac{x-5}{3} = \frac{y-4}{7} = \frac{z-6}{2}$. Write its vector form.

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9. Define optimal solution in linear programming problem.

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10. Find $P(A/B), \quad \text{if} \quad P(B) = 0.5 \text{ and } P(A \cap B) = 0.32$

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Part B

1. Define binary operation on a set. Verify whether the operation * is defined on Q set of rational number by a *b=ab+1, $\forall a, b \in Q$ is binary or not.

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

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3. Find the value of $\cos^{-1}\left(.\cos\frac{13\pi}{6}\right)$

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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. Find $\frac{dy}{dx}$, if $y = \sec^{-1}\left(\frac{1}{2x^2 - 1}\right), 0 < x < \frac{1}{\sqrt{2}}$

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6. Differentiate $(\sin x)^{\cos x}$ with respect to x.

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7. If the radius of a sphere is measured as 7 m with an error of 0.02m, then approximate error in calculating its volume.

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8. Evaluate $\int \cos 6x \sqrt{1+\sin 6x}\, dx.$

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9. Integrate $\frac{xe^x}{(1+x)^2}$ with respect to x.

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

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12. Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$

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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=3`

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14. The random variable X has a probability distribution P(X) of the following form, where K is some number $P(X) = \begin{cases} K & \text{if x} = 0 \\ 2K & \text{if x} = 1 \\ 3K & \text{if x} = 2 \\ 0 & \text{otherwise} \end{cases}$

(a) Determine the value of K.

(b) Find $P(X < 2)$.

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Part C

1. If $f: R \to R$ and $g: R \to R$ are given by by f(x)=cos x and $g(x) = 3x^2$, then shown that $gof \neq fog$.

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2. Solve $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$

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3. By using elementary operations, find the inverse of the matrix $A = \begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}$

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4. If $x = a(\theta - \sin\theta)$ and $y = a(1 + \cos\theta)$, then proe that $\frac{dy}{dx} = -\cot\left(\frac{\theta}{2}\right)$.

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5. Verify Mean Value Theorem if $f(x) = x^2 - 4x + 3$ in the interval $x \in [a, b], a = 1$ and $b = 4$.

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6. Find two positive number whose sum is 15 and the sum of whose squares is minium.

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7. Evaluate: $\int_0^1 \frac{\tan^{-1} x}{1 + x^2} dx$

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8. Integrate $\frac{dx}{x(x^2+1)}$ with respect to x.

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9. Find the area of the parabola $y^2 = 4ax$ bounded by its latus rectum.

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10. Find the differential equation representing the family of curves y=asin (x+b), where a,b are arbitrary constants.

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

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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 equation of the plane through the intersection of the planes. 3x-y+2z=0 and x+y+z-2=0 and the point (2,2,1)

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14. A man is known to speak truth 4 out 5 times. He tossed a coin and reports that is head. Find the probability that it is actually head.

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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 $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}$, $B = [-1, 2, 1]$, verify that (AB)'=B'A'

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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. If $y = Ae^{mx} + Be^{nx}$, prove that $\frac{d^2y}{dx^2} - (m+n)\frac{dy}{dx} + mny = 0.$

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5. 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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6. Find the integral of $\frac{1}{\sqrt{a^2 - x^2}}$ with respect to x and hence find $\int \frac{1}{\sqrt{7 - 6x - x^2}dx}$

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7. Find the area of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} - 1, (a > b)$ by the method of integration and hence find the area of the ellipse $\frac{x^2}{16} + \frac{y^2}{19} = 1.$

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8. Find the general solution of the differential equation $x\frac{dy}{dx} + 2y = x^2, (x \neq 0)$

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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. A person buys a lottery ticket in 50 lotteries, in each of which his chance of winning and prize is $\frac{1}{100}$. What is the probability that he will win a prize.

(a) at least once

(b) exactly once

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Part E

1. Prove that $\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_{0}^{a} f(x)dx & \text{if f(x) is an even function} \\ 0 & \text{if f(x) is an odd function} \end{cases}$

and hence evaluate $\int_{-\pi/2}^{\pi/2} (x^3 + x\cos x)dx.$

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2. 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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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. Prove that $\begin{vmatrix} x+y+2z & x & y \\ z & y+z+2z & y \\ z & x & z+x+2y \end{vmatrix} = 2(x+y+z)^3.$

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