MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

SUPPLEMENTARY EXAM QUESTION PAPER 2017

Part A

1. Find the identify element for the binary operation *, defined on the set of Q of rational number, by $a \cdot b = \frac{ab}{4}$

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2. Write the values of x for which $\tan^{-1}\frac{1}{x} = \cot^{-1} x$, holds.

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3. Construct a 2×2 matrix, $A = [a_{ij}]$, whose elements are given by $a_{ij} = \frac{i}{j}$

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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. Find $\frac{dy}{dx}$ if $y = \sin(x^2)$

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6. Find $\int \cos 3x dx$

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7. Find unit vector in the direction of vector $\hat{i} + \hat{j} + 2\hat{k}$

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8. Write the direction consines of y-axis.

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9. Define optimal solution in linear programming problem.

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10. If $P(A) = 0.8$ and $P(B/A) = 0.4$ then find $P(A \cap B)$

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Part B

1. Show that if $f: A \to B$ and $g: B \to C$ are onto, then $gof A \to C$ is also onto.

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2. Prove the following:

$$2\tan^{-1} x = \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right), x \geq 0$$

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3. Simplify the following:

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

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4. Using determinant method, find the area of the triangle whose vertices are (1,0),(6,0) and (4,3).

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5. Differentiate $(\sin x)^x$ with respect to x.

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

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7. Find the point on the curve $\frac{x^2}{4} + \frac{y^2}{25} = 1$ at which the tangents are parallel to x-axis.

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8. Evaluate: $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx.$

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9. Evaluate: $\int \frac{x-3}{(x-1)^3} e^x dx$

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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 $\vec{a}$ is a unit vector and $\left(\vec{x} - \vec{a}\right).\left(\vec{x} + \vec{a}\right) = 8$, then find $\left|\vec{x}\right|$.

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12. Find the area of the parallelogram whose adjacent sides are given by the vectors $\vec{a} = 3\hat{i} + \hat{j} + 4\hat{k}$ and $b = \hat{i} - \hat{j} + \hat{k}$.

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13. Find the angle between the pair of lines given by $\vec{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \lambda\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right), \vec{r} = 7\hat{i} - 6\hat{k} + \mu\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

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14. If A and B are two adjacent events, then prove that the probability of occurance of atleast one of A and B is given by $1 - P(A')P(B')$

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Part C

1. Check whether the relation R defined in the set {1,2,3,4,5,6} as R{(a,b): b=a+1)} is reflecxive or symmetric.

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

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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. Find $\frac{dy}{dx}$, if $x = a\left(\cos t + \log \tan \frac{t}{2}\right), y = a \sin t.$

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5. Verify Mean Value Theorem for the function $f(x) = x^2$ in the interval [2,4].

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

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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 bounded by the curve y=cos x between x=0- and $x = 2\pi$

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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. Show that the position vector of the point P, which divides the line joining the points A and B having position vectors $\vec{a}$ and $\vec{b}$ internally in the ratio $m:n$ is $\frac{m\vec{b} + n\vec{a}}{m+n}$

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12. Find x such that the four point A(3,2,1),B(4,x,5),C(4,2,-2) and D(6,5,-1) are coplanar.

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13. Find the vector and cartesian equation of the plane which passe3s throught the points (5,2,-4) and perpendicular to the line with direction ratios 2,3,-1.

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14. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

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

Calculate AC, BC and (A+B)C. Also verify that (A+B)C=AC+BC.

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

x+y+z=6

y+3z=11

x-2y+z=0

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4. If y=3 cos(log x)+4 sin(log x), show that $x^2y_2 + xy_1 + y = 0$

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5. Sand is pouring from a pipe at the rate of $12cm^3/s$. The falling sand forms a cone on the top of ground in such a way that the height of the cone is always one-sixth of the radius of the base. How fast is the height of the sand cone increasing when the height is 4cm?

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6. Find the integral of $\sqrt{a^2 + x^2}$ with respect to x and hence evaluate $\int \sqrt{1 + x^2} dx$

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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 $ydx - \left(x + 2y^2\right)dy = 0$

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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. If a fair coin is tossed 10 times, find the probability of.

(i) exactly six heads and (ii) atleast six heads.

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Part E

1. Minimize z=-3x+4u subject to the constraints

$x + 2y \leq 8$

$3x + 2y \leq 12$

$x \geq 0, y \geq 0$ by graphical method.

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2. 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 $\int_{-\pi/2}^{\pi/2} \left(x^3 + x\cos x\right)dx.$

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