MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

ANNUAL EXAM QUESTION PAPER 2015

Part A

1. Let * be a binary operation defined on the set of non-zero rational number, by $a * b = \frac{ab}{4}$. Find the identity element.

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2. Write the set of the value of x for which $2\tan^{-1} x = \cos^{-1}\frac{1-x^2}{1+x^2}$ holds.

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3. Construct a 2xx2 matrix $A = [a_{ij}]$ whose elements are given by $\frac{1}{2}|-3i+j|$.

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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 $\left(x^2+5\right)$.

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6. Evaluate : $\int \frac{e^x(x-1)}{x^2} dx$.

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7. Define negative of a vector.

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8. Write the direction "cos"ines of x-axis.

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9. Define feasible region.

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10. If $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$ find $P(A \cap B)$, where A and B are independent events.

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Part B

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

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2. Prove the following:

$$\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\sin^{-1}x, \ -\frac{1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$$

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3. Prove that $2\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{7} = \tan^{-1}\frac{31}{17}$

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4. If the area of the triangle with vertices (-2, 0), (0, 4) and (0, k) is 4 square units, find the values of k u"sin"g determinants.

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5. Differentiate $\left(x+\frac{1}{x}\right)^{x}$ w.r.to x.

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6. Find the slope of the tangent to the curve $y=\frac{x-1}{x-2}, x \neq 2$ at $x=10$.

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7. Find $\frac{dy}{dx}$ given $x^2+xy+y^2=100$.

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8. Evaluate, $\int \frac{\cos 2x - \cos 2a}{\cos x - \cos a} dx$.

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Part C

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

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2. Find the order and degree, if defined of the differential equation.

$$\frac{d^2y}{\left(dx^2\right)^3} + \left(\frac{dy}{dx}\right)^2 + \sin\frac{dy}{dx} + 1 = 0.$$

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3. Find $\left|\vec{b}\right|$,if $\left(\vec{a} + \vec{b}\right).\left(\vec{a} - \vec{b}\right) = 8$ and $\left|\vec{a}\right| = 8\left|\vec{b}\right|$.

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4. 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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5. Find the angle between the following pairs of lines :

$\vec{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$ & $\vec{r} = 5\hat{i} - 2\hat{j} + \mu\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$

Note : Angle between two lines is the angle between $\vec{b_1}$ and $\vec{b_2}$

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6. Let X denote the number of hours you study during a randomly selected school day.The probability that X can take the values of .x, has the following form, where K is some cons"tan"t.

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7. Determine whether the relation R in the set A={1,2,3,.....13,14} defined as R={(x-y),3x-y=0} is reflexive, symmetric and transitive.

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

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9. If A and B are square matrices of the same order, then show that $(AB)^{-1}=B^{-1}A^{-1}$.

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10. Verify Rolle's theorem for the function $f(x)=x^2+2x-8, x\in[-4,2]$.

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11. If $x = \sqrt{a^{\sin^{-1}t}}$ then prove that $\frac{dy}{dx} = \frac{-y}{x}$

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

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13. Evaluate: $\int x\tan^{-1}x dx$

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14. Evaluate: $\int_0^2 e^x dx$ as a limit of sum.

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

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Part D

1. 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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2. 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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3. Find the equation of the plane through the intersection of the planes $3x - y + 2z - 4 = 0$ and $z + y + z - 2 = 0$ and the point (2,2,1)`.

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4. Form the differential equation of the circles touching the x-axis at orgin.

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5. 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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6. Let R+ be the set of all non-negative real numbers. Show that the function $f: R+ \to [4, \infty]$ given by $f(x) = x^2 + 4$ is invertible and write the inverse of f.

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7. 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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8. Use the product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & -0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations

$x - y + 2z = 1$

$2y - 3z = 1$

$3x - 2y + 4z = 2$

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

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10. 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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11. 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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12. Find the area of the triangle whose vertices are :

(2, 3), (-1, 0), (2, -4)

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13. 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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14. 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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15. A die is thrown 6 times. If getting an odd number is success, What is the probability

(a) 5 successes

(b) at least 5 successes

(c) at most 5 successes

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Part E

1. Prove that $\int_{-a}^{a} dx = \begin{cases} 2\int_0^a f(x)dx & \text{if } f(x)\text{is even} \\ 0 & \text{if } f(x)\text{is odd} \end{cases}$ and hence evaluate

(a) $\int_{-1}^{1} \sin^5 x \cos^4 x dx.$

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2. $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix} = 1 + a^2 + b^2 + c^2.$

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3. 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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4. (b) Find the value of K so that the function $f(x) = [(Kx + 1), (3x - 5), \quad \text{if} \quad x \leq 5, \quad \text{if} \quad x > 5]atx = 5$ is a continuous function.

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