MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

SUPPLEMENTARY EXAM QUESTION PAPER JULY 2015

Part A

1. Let* be a binary operation on the set of natural numbers given by a*b-L.C.M of a and b,find 5*7.

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2. Evaluate $\sin^{-1}\left(\sin\left(\frac{2\pi}{3}\right)\right)$

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3. Define a scalar matrix.

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4. Find |3A|,if $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$

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5. Find if $\frac{dy}{dx}$ if $y = \cos\left(\sqrt{x}\right)$.

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

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7. Show that the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $-4\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear.

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8. Find the intercepts cut-off by the plane $2x + y - z = 5$.

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9. Define optimal solution in linear programming problem.

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10. If $P(A) = 0.8, P(B) = 0.5$ and $P(B \mid A) = 0.4$, then find $P(A \cap B)$.

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Part B

1. If $f : R \rightarrow R$ is given by $f(x) = \left(3 - x^3\right)^{\frac{1}{3}}$ then sind $(fof)(x)$.

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2. Write the simplest from 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

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

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

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6. 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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7. Using differentials, find the approximate value of each of the following upto 3 place of decimal.

(ii) $\sqrt{49.5}$

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

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

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10. Find the order and degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^2 + \cos\left(\frac{dy}{dx}\right) = 0$$

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11. Find the projection of the vector $\hat{i} + 3\hat{j} - 7\hat{k}$ on the vector $7\hat{i} + \hat{j} + 8\hat{k}$

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

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13. Find the probability distribution of number of tails in the simultaneous tosses of three coins .

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Part C

1. Prove that the relation R in the set of integers Z defined by R = {(x,y) : x - y. is an integer) is an equivalence relation.

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

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3. Express $A = \begin{bmatrix} 3 & 1 \\ 5 & -1 \end{bmatrix}$ as sum of symmetric and skew symmetric matrix.

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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 Rolle's theorem for the function $f(x) = x^2 - 4x - 3$, in the interval [1,4].

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6. Find two number whose sum is 24 and whose product is larger as possible.

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

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

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9. Find area lying between the curves $y^2 = 4x$ and $y = 2x$ is

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

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12. Find lambda, if the vectors $\vec{a} = \hat{i} + 3\hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} - \hat{k}$ and $\vec{c} = \lambda\hat{i} + 7\hat{j} + 3\hat{k}$ are coplaner.

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13. Find the distance between the lines $\vec{r} = \hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right)$ and $\vec{r} = 3\hat{i} + 3\hat{j} - 5\hat{k} + \mu\left(2\hat{i} + 3\hat{t}j + 6\hat{k}\right)$.

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14. Bag I contains 3 red and 4 black balls. While Bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from Bag II.

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Part D

1. Prove that the funciton $f: R \rightarrow R$ defined by f(x)=4x+3 is invertible and find the inverse of f.

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2. If $A = \begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix}$ thern compute (A+B) and (B-C). Also verify A+(B-C)=(A+B)-C.

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3. Solve system of linear equations , using matrix method

$2x + 3y + 3z = 5$

$x - 2y + z = -4$

$3x - y - 2z = 3$

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4. If $y = \left(\tan^{-1}x\right)^2$ then show that

$$\left(x^2+1\right)^2 \frac{d^2y}{dx^2} + 2x\left(x^2+1\right)\frac{dy}{dx} = 2$$

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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 ground in such a way that the height of the cone is always one-sixth of the base. How fast height of the sand cone increasing when the height is 4 cm?

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6. 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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7. Find the area bounded by the curve $(x - 1)^2 + y^2 = 1$ and $x^2 + y^2 = 1$.

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8. Find the general solution of the differential equation

$$\left(x+3y^2\right)\frac{dy}{dx}=y(y<0)$$

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9. 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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Part E

1. One king of cake requires 200 g of flour and 25 g of fat another kind of cake requires 100 g of flour and 50 g of fat . Find the maximum number of cakes which can be made from 5 kg of flour and 1 kg of fat assuming that there is no shortage of the other ingredients used in making the cakes.

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2. Find the values of a and b such that the function defined by

$$f(x) = \begin{cases} 5 & \text{if} \quad x \leq 2 \\ ax + b & \text{if} \quad 2 < x < 10 \\ 21 & \text{if} \quad x \geq 10 \end{cases}$$ is

continuous function.

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3. Prove that $\int_a^b (x)dx = \int_a^b f(a+b-x)dx$

and $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan x}}$.

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4.

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

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