MATHS

BOOKS - SUNSTAR MATHS (KANNADA ENGLISH)

SUPPLEMENTARY EXAM QUESTION PAPER JULY- 2015

Part A Answer All The Ten Questions

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. Find the value of $\sin^{-1}\left(\sin\frac{2\pi}{3}\right)$

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3. define a scalar matrix.

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4. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$,then show that $|3A| = 27|A|$

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5. Differentiate $\cos\sqrt{x}$ w.r.t.x

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

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

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8. Find the intercepts cutoff 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 Answer Any Ten Questions

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

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2. Write the simplest form 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 area of the triangle with vertices (-2, 0), (0, 4) and (0, k) is 4 square units, find the value of 'k' using 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 $\sqrt{49.5}$

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

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9. Evaluate:

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

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10. Find the order and degree of the differential equation

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

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

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12. $|\vec{a}|=3, \left|\vec{b}\right|=\sqrt{2}/3$ and $\left|\vec{a}\times\vec{b}\right|=1$. find the angle between $\vec{a}$ and $\vec{b}$

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

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14. Find the probability distribution of

(i) number of heads in two tosses of a coin.

(ii) number of tails in the simultaneous tosses of three coins.

(iii) number of heads in four tosses of a coin.

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Part C Answer Any Ten Questions

1. Prove that the relation R in the set of integers z defined by $R = \{(x, y) : x - y \text{ is an integer }\}$ 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 $A = \begin{bmatrix} 3 & 5 \\ 1 & -1 \end{bmatrix}$ as sum of symmetric and skew symmetric matrix.

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4. Find $\frac{dy}{dx}$, if $x = a[\cos t + \log(\tan t/2)] \& y = a \sin t$

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5. Verify Mean value theorem, if $f(x) = x^2 - 4x - 3$ in the interval [a,b] where a=1 and b=4

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

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

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

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9. Find the area lying between the curve $y^2 = 4x$ and the line $y = 2x$

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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 vectors $\left(\vec{a} + \vec{b}\right)$ 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. Find λ 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 coplanar

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

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14. A Bag I contain 3 red and 4 black balls. White bag II contains 5 red 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 Answer Any Six Questions

1. Prove that the function $f : R \rightarrow R$ 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 $C = \begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix}$

then compute (A + B) and (B - C). Also verify that 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 $y = \left(\tan^{-1} x\right)^2$, show that

$\left(x^2 + 1\right)^2 y_2 + 2x\left(x^2 + 1\right) y_1 = 2.$

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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 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 $\sqrt{x^2 + a^2}$ with respect to 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 and Cartesian form.

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10. Five cards are drawn successively with replacement from a with replacement from a well shuffled deck of 52 cards . What is the probability that

I. all five cards are spades ?

II. Only 3 cards are spades ?

III. None is spade ?

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Part E Answer Any One Question

1. One kind of cake requires 200 gm of flour and 25 g of fat and another kind of cake requires 100 gm of flour and 50 gm of fat. Find the maximum number of cakes which can be made from 5kg of flour and 1kg 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 that

$$f(x) = \begin{cases} 5, & \text{if} x \le 2 \\ ax+b, & \text{If} 2 < x < 10 \\ 21, & \text{if } \ x \ge 10 \end{cases}$$ is a continuous function

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3. Prove that $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$ and hence evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{1+\sqrt{\tan x}}dx$.

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

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