MATHS

BOOKS - OSWAAL PUBLICATION MATHS (KANNADA ENGLISH)

II PUC MARCH-2016

Part A

1. Find $\int \cos ec x(\cos ec x + \cot x)dx$.

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2. 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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3. If $y = a^{\frac{1}{2}\log_a \cos x}$, find $\dfrac{dy}{dx}$

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4. $\cos\left(\sec^{-1} x + \cos ec^{-1} x\right), |x| \geq 1$

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5. If vector $\overline{AB} = 2\hat{i} - \hat{j} + \hat{k} \text{ and } \overline{OB} = 3\hat{i} - 4\hat{j} + 4\hat{k}$, find the position vector $\overline{OA}$

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6. Find the distance of the point $(-6, 0, 0)$ from the plane $2x - 3y + 6z = 2.$

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7. If $\begin{bmatrix} x+2 & y-3 \\ 0 & 4 \end{bmatrix}$ is a scalar matrix. Find x and y.

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8. If $P(A) = 0.8 \text{ and } P(B/A) = 0.4$ then find $P(A \cap B)$

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9. An operation $*$ on Z^* (the set of all non-negative integers) is defined as $a * b = a - b, \forall a, b \varepsilon Z^+$. Is $*$ binary operation on Z^+?

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10. Define feasible region in a linear programming Problem.

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Part B

1. Write the simplest form of $\tan^{-1}\left[\dfrac{3\cos x - 4\sin x}{4\cos x + 3\sin x}\right]$, if $\dfrac{3}{4}\tan x > -1$

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2. Using determinants show that points A(a, b + c), B(b, c + a) and C(c, a + b) are collinear.

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3. If functions $f: R \to R$ and $g: R \to R$ are given by $f(x) = |x|$ and $g(x) = [x]$, where [x] is greatest integer function find $fog\left(-\dfrac{1}{2}\right)$ and $gof\left(-\dfrac{1}{2}\right)$.

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4. Prove the following:

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

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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. If $x^y=a^x$, prove that $\frac{dy}{dx}=\frac{x\log_e a-y}{x\log_e x}$.

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7. find $\int\frac{1}{\sin x\cos^3 x}$dx.

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8. Using differentials, find the approximate value of$(25)^{\frac{1}{3}}$.

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9. Evaluate : $\int_0^{\pi}\left(\sin^2\left(\frac{x}{2}\right)-\cos^2\left(\frac{x}{2}\right)\right)dx$

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10. If $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}-\vec{b}\right|$, prove that $\vec{a}$ and $\vec{b}$ are perpendicular.

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11. 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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12. Find angle between the vectors $\vec{a} = \vec{i} + \hat{j} - \hat{k}$ and $\vec{b} = \hat{i} + \hat{j} + \hat{k}$.

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13. 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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14. Find the Cartesian equation of the line parallel to y-axis and passing through the point (1, 1, 1).

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Part C

1. Show that $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{2}{11} + \tan^{-1}\frac{4}{3} = \frac{\pi}{2}$

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2. Using elementary transformations, find the inverse of the matrices

$$\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$$

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3. Show that the relation R in the set $A = \{x \in z, 0 \leq x \leq 12\}$ given by

$R = \{(a, b) : |a - b|$ is a multiple of 4} is an equivalence relation.

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

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5. If $x = a\cos^3 0$ and $y = a\sin^3 = 0$, prove that $\frac{dy}{dx} = -\sqrt[3]{\frac{y}{x}}$.

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6. Box-I contains 2 gold coins, while another Box-II contains 1 gold and 1 silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold?

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

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

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9. Find two numbers whose product is 100 and whose sum is minimum.

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

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11. For any three vectors $\vec{a}, \vec{b}$ and $\vec{c}$, prove that vectors $\vec{a} - \vec{b}, \vec{b} - \vec{c}$ and $\vec{c} - \vec{a}$ are coplanar.

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12. Find the distance between the lines $\overrightarrow{l_1}$ and $\overrightarrow{l_2}$ given by

$\overrightarrow{l_1} = \hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right)$ and $\overrightarrow{l_2} = 3\hat{i} + 3\hat{j} - 5\hat{k} + \mu\left(2\hat{i} + 3\right.$

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13. Find the sine of the angle between the vectors $\hat{i} + 2\hat{j} + 2\hat{k}$ and $3\hat{i} + 2\hat{j} + 6\hat{k}$.

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14. Find the equation of the curve passing through the point $(1, 1)$, given that the slope of the tangent to the curve at any point is $\frac{x}{y}$

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Part D

1. If $A = \begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & -6 \end{bmatrix}$, verify that $(AB)' = B'A'$.

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2. Solve the system of linear equations by matrix method :

$2x - 3y + 5z = 11, 3x + 2y - 4z = -5, x + y - 2x = -3.$

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3. Let $f: N \rightarrow R$ be defined by $f(x) = 4x^2 + 12x + 15$. Show that $f: N \rightarrow S$ where S is the range of function f, is invertible. Also find the inverse of f.

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4. The length x of a rectangle is decreasing at the rate of 3 cm/min and the width y is increasing at the rate of 2cm/min. When x=10cm and y=6cm, find the ration of change (i) the perimeter and (ii) the area of the reactangle.

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5. If $y = (\sin^{-1} x)$. Show that $(1 - x^2)\frac{d^2y}{dx^2} - x\left(\frac{dy}{dx}\right) = 0$

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6. Find the integral of $\frac{1}{x^2 + a^2}$ w.r.t.x and hence evaluate $\int \frac{1}{x^2 + 2x + 3}$ dx.

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7. Using integration find the area of the region bounded by the triangle whose vertices are (1,0),(2,2) and (3,1).

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8. 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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9. The probability that a student is not a swimmer is $\frac{1}{5}$. Find the probability that out of 5 students.

at most three are swimmers.

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10. Solve the differential equation $ydx + (x - ye^y)dy = 0$

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Part E

1. Find the value of k, if

$$f(x) = \frac{1 - \cos 2x}{1 - \cos x} \quad x \neq 0$$
$$= k \qquad\qquad x = 0$$

is continuous at $x = 0$.

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2. Prove that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$

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