MATHS

BOOKS - OSWAAL PUBLICATION MATHS (KANNADA ENGLISH)

SOLVED PAPER (Topper Answers March - 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 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 $\left(x^2 + 5\right)$.

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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 in a linear programming Problem.

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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. Differentiable $\left(x+\frac{1}{x}\right)^{x}$ with respect 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. Evalute : $\int \frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha} dx.$

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

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

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

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

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

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

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

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

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17. Evalute : $\int x \tan^2 x dx.$

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18. Evalute : $\int_0^2 e^x$ dx as the limit of a sum.

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

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20. 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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Part D

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

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

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5. 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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6. Find the integral of $\frac{1}{\sqrt{x^2 - a^2}}$ with respect to x and hence evalute $\int \frac{dx}{\sqrt{x^2 + 6x - 7}}$.

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7. Using integration find the area of the triangular region whose sides have the equations $Y = 2x + 1, y = 3x + 1$ and $x = 4$.

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8. 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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9. 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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10. 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 manufacturing company makes two modeis A and B of a product. Each piece of model A requires 9 labour hours for fabricating and 1 labour hour for finishing. Fach piece of model B requires 12 labour hours for fabricating and 3 labour hours for finishing. For fabricating and finishing, the maximum labour hours available are 180 and 30 respectively. The company makes a profit of Rs. 8,000 on each piece of modal A and Rs. 12,000 on week maximum profit ? What is the maximum profit per week ?

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4. The function is defined by $f(x) = \begin{cases} kx + 1 & \text{if} \quad x \leq 5 \\ 3x - 5 & \text{if} \quad x > 5 \end{cases}$ is continuous at x = 5. Find k.

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