MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

MODEL QUESTION PAPER 3

Part A

1. Let * be a binary operation on N defined by $a * b = LCM$ of a and b.

Find $20 * 16$.

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2. Write the domain of f(x) $= \tan^{-1}$x

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3. Construct a 3×3matrix $A = (a_y)$ whose elements are given by $a_y = \frac{1}{j}$

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4. If $\begin{vmatrix} x & 2 \\ 3 & x \end{vmatrix} = \begin{vmatrix} x & 2 \\ -3 & -x \end{vmatrix}$ find the value of x.

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5. Differentiate $\log(\cos e^x)$ with respect to x

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6. Evaluate : $\int \tan^{22} x . dx$

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7. Find the angle between the two vectors $\vec{a}$ and $\vec{b}$ such that $\left|\vec{a}\right| = 1, \left|\vec{b}\right| = 1$ and $\vec{a} . \vec{b} = 1$

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8. Find the equation of the plane with intercept 3 on the Y-axis and parallel to ZOX - plane.

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9. Defione objective function in Linear Programming Problem.

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10. A fair die is rolled. Consider the events E $= \{1, 3, 5\}$ and F={2.3} find P(E/F)

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Part B

1. Show that the relation R in the set of integers given by R= {(a,b) : 5 divides (a - b)} is symmetric and transitive.

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2. Simplify the following:

If $\sin\left\{\sin^{-1}\frac{1}{5}+\cos^{-1}x\right\}=1$ find x

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3. Write the following in the simplest form:

$\tan^{-1}\frac{\sqrt{1+x^2}-1}{x}, x\neq 0$

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4. If the area of the triangle with vertices (2,-6),(5,4) and (K,4) is 35 sq. units, then find the values of K, using determinants.

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5. Find the derivative of $\sqrt{x} + \sqrt{y} = 9 \quad \text{at} \quad (4, 9)$.

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6. If $y = \log_7(\log x)$ find $\frac{dy}{dx}$.

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7. Evaluate $\int \frac{3x^2}{1 + x^6} dx$

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

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9. Find the slope of the tangent to the curve $y = x^3 - 3x + 2$ at the point whose x-coordinate is 3.

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10. Find the order and degree of the differential equation, $xy, \frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 - y\frac{dy}{dx} = 0.$

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11. Show that the points A, B and C with position vectors , $\vec{a} = 3\hat{i} - 4\hat{j} - 4\hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{c}\,\hat{i} - 3\hat{j} - 5\hat{k}$ respectively, from the vertices of a right angled triangle.

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12. Find |x|, if for a unit vector a $\left(\vec{x}-\vec{a}\right)\left(\vec{x}+\vec{a}\right)=12$

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13. Find the distance of the point (2,3,-5) from the plane $r.(i+2j-2k)=9.$

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14. If the probability distribution of X is

X	0	1	2	3	4
P(X)	0.1	k	2k	2k	k

Find the value of K.

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Part C

1. Let $A = R - \{3\}$ and $B = R - \{1\}$. Consider the function $f: A \to B$ defined by $f(x) = \left(\frac{x-2}{x-3}\right)$. Is f one-one and onto ? Justify your answer.

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2. $\tan\frac{1}{2}\left[\sin^{-1}\frac{2x}{1+x^2} + \cos^{-1}\frac{1-y^2}{1+y^2}\right]$

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3. If $y = \tan^{-1}\left(\frac{1+\sin x}{\cos x}\right)$ shoe that $\frac{dy}{dx} = \frac{1}{2}$.

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4. Differentiate $x^{\sin x} + (\sin x)^{\cos x}$ w.r.t x.

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5. Find the absolute maximum value and the absolute minimum value of the following functions in the given interval .

(b) $f(x) = \sin x + \cos x, x \in [0, \pi]$

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6. Evaluate : $\int \frac{dx}{x(x^n + 1)}$

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7. Find : $\int e^x \sin x dx.$

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8. Find the area of the circle $x^2 + y^2 = 4$ bounded by the lines x =0 and x = 2 which is lying iii the first quadrant.

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9. In a bank, principle p increases continuously at the rate of 5% per year. Find the principal in terms of time t.

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

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11. If $\vec{a} = -4\hat{i} - 6\hat{j} - \lambda\hat{k}$, $\vec{b} = -\hat{i} + 4\hat{j} + 3\hat{k}$ and $\vec{c} = -8\hat{i} - \hat{j} + 3\hat{k}$ are coplanar find λ

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12. Find the equation of the line which passes through the point (1,2,3) and is parallel to the vector $3\hat{i} + 2\hat{j} - 2\hat{k}$f both in vector form and Cartesian form.

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13. 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. Consider $f: R \to [-5\infty]$ given by $f(x)9x^2 + 6x - 5$, show that f is invertible with $f^{-1}(y) = \left\{\frac{\sqrt{y+6}}{3}\right)\}$

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$$A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & -3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$$

2. If A=

Verify $A^3 - 3A^2 - 10A + 24I = 0$ where O is zero matrix of order 3×3

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3. Solve by matrix method:

$x + y + z = 6$

$x - 2y + 3z = 6$

$x - y + z = 2$

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

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5. A man of height 2 metres walks at a uniform speed of 5 km/h away from a lamp post which is 6 metres high. Find the rate at which the length of his shadow increases.

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6. Find the integral of $\frac{1}{\sqrt{x^2+a^2}}$ w.r.t x and hence evaluate $\int \frac{1}{\sqrt{x^2+2x+4}} dx$

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7. Find the area of the region enclosed by the parabola $x^2 = 4y$ and the line $x = 4y - 2$ and the x axis

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8. Derive the equation of a plane in normal form both in the vector and Cartesian form .

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9. Find the particular solution of the differential equations

$\frac{dy}{dx} + \frac{2xy}{1+x^2} = 1$ when y=0 and x=1

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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. 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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2. 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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3. A furniture dealer deals in only two items - tables and chairs. He has Rs. 50,000 to invest and has storage pince of at most 60 pieces. A table costs Rs. 2500 and a chair Rs. 500. He estimates thnt from the sale of one table , he can make a profit of Rs. 250 and that from the sale of one chair a profit of Rs. 75. How many tables and chairs he should buy from the available money so as to maximise his total profit assuming that he can self all the items which he buys.

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4. Find the points of discontinuity of the function $f(x) = x - [x]$ where [x] indicates the greatest integer not greater than x. Also write the set of value of x where the function is continuous.

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