



MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

SUPER MODEL QUESTIONS PAPER (WITH ANSWERS)

Part A

1. Define a transitive relation.



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2. Write the set of the value of x for which

$$2 \tan^{-1} x = \cos^{-1} \frac{1 - x^2}{1 + x^2} \text{ holds.}$$



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3. Construct a 2×3 whose elements are given by

$$a_{ij} = |i - j|.$$



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



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5. $\cos(\sin x)$



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6. Find $\int \cos 3x dx$



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7. Find the direction cosines of the vector

$$\hat{i} + 2\hat{j} + 3\hat{k}$$



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



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9. Define feasible region.



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10. Given that E and F are events such that $P(E)=0.6$, $P(F)=0.3$ and $P(E \cap F) = 0.2$, find $P(E/F)$ and $P(E \setminus F)$.



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Part B

1. Show that the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^2 \forall x \in \mathbb{R}$ is neither injective nor surjective.



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



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3. Simplify the following:

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



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4. Find area of the triangle with vertices $(2,7),(1,1),$
 $(10,8)$.



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5. Find the Continuity of function $f(x)$.

$$f(x) = \begin{cases} |x| + 3 & \text{if } x \leq -3 \\ -2x & \text{if } -3 < x < 3 \\ 6x + 2 & \text{if } x \geq 3 \end{cases}$$



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6. Is the function defined by $x^2 - \sin x + 5$

continuous at $x = \pi$?



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7. $y = x^4 - 6x^3 + 13x^2 - 10x + 5$ at (0,5).



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8. $\int_{-1}^1 (x + 1) dx.$



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9. $\int_2^3 \frac{1}{x} dx$



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10. $y = \sqrt{1 + x^2}$ and $y' = \frac{xy}{1 + x^2}$



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11. If the position vectors of the points A and B respectively are $i+2j-3k$ and $j-k$ find the direction cosines of AB



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12. Find unit vector in the direction of vector $\hat{i} + \hat{j} + 2\hat{k}$



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



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14. A die is thrown. If E is the event 'the number appearing is a multiple of 3' and F is the event 'the number appearing is even', then find whether E and F are independent?



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1. Show that the relation R in the set $A = \{x \in \mathbb{Z}, 0 \leq x \leq 12\}$ given by $R = \{(a, b) : |a - b| \text{ is a multiple of } 4\}$ is an equivalence relation.

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2. Show that $\sin^{-1} \frac{3}{5} - \sin^{-1} \frac{8}{17} = \cos^{-1} \frac{84}{85}$

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3. Find the value of a,b,c and d from the equation:

$$\begin{bmatrix} a - b & 2a + c \\ 2a - b & 3c + d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$$



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4. $y = \sin^{-1}\left(\frac{1 - x^2}{1 + x^2}\right), 0 < x < 1.$



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5. $x = \sin t, y = \cos 2t.$



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6. Find the point on the curve $y = x^2 - 11x + 5$ at which the tangent is $y=x-11$.



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7.
$$\int \frac{dx}{\sqrt{1 + 4x^2}}.$$



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8.
$$\int \frac{3x}{1 + 2x^4} dx$$



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9. Find the area of the region bounded by the

ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$.



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10. Form the differential equation of the family of circles touching the y-axis at origin.



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11. Find the area of the triangle with vertices

A(1,1,2), B(2,3,5) and C(1,5,5).



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12. Find the area of the parallelogram whose adjacent sides are determined by the vectors

$$a = \hat{i} - \hat{j} + 3\hat{k} \text{ and } b = 2\hat{i} - 7\hat{j} + \hat{k}.$$



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13. Find the vector and the Cartesian equation of the line that passes through the points $(3,-2,-5)$, $(3,-2,6)$.



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14. Consider the experiment of tossing two fair coins simultaneously, find the probability that both are head given that at least one of them is a head.



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Part D

1. If R_+ is the set of all non-negative real numbers prove that the $f: R_+ \rightarrow (-5, \infty)$ defined by

$f(x) = 9x^2 + 6x - 5$ is invertible. 39. Write also, $f^{-1}(x)$.

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2. If

$$A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 \\ -1 & 4 \end{bmatrix} \text{ and } C = \begin{bmatrix} 2 & -2 \\ 3 & 0 \end{bmatrix}$$

verify that $A(BC) = (AB)C$.

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3. The cost of 4kg onion, 3 kg wheat and 2kg rice in Rs. 60. The cost of 2kg onion, 4 kg wheat and 6

kg rice in Rs.90. The cost of 6kg onion, 2kg wheat and 3 kg rice is Rs.70. Find cost of each item per kg by matrix method.



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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. The length x of rectangle is decreasing at the rate of 5cm/minute and width y is increasing at

the rate of 4 cm/minute. When $x=8$ cm and $y=6$ cm, find the rate of change of (i) the perimeter and (ii) the Area of the rectangle.



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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 of the region bounded by the parabola $y = x^2$ and $y = |x|$.



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8. Solve $\frac{dy}{dx} + 3y = e^{-2x}$.



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



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10. From a lot of 30 bulbs which include 6 defective, a sample of 4 balls is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.



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Part E

1. (a) Prove that $\int_0^{2x} f(x) dx = 2 \int_0^{2x} f(x) dx$ when $f(2a - x) = f(x)$ and hence evaluate

$$\int_0^{\pi} |\cos x| dx.$$

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



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