MATHS

BOOKS - CBSE COMPLEMENTARY MATERIAL

MATHS (HINGLISH)

PRACTICE PAPER I

Section A

1. Find the sum of order and degree of the differential equation $\frac{d^2y}{dx^2} = \left[1 + \left(\frac{dy}{dx}\right)^2\right]^3$

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2. Write the smallest reflexive relation on set A = {1, 2, 3, 4, 5}.

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3. Write the value of $\tan^{-1} 2 + \tan^{-1} 3$.

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4. Write the integrating factor of the differential equation

$$\frac{dx}{dy} + x \tan y - \sec y = 0$$

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5. Find $'\lambda'$. If the vectors $\lambda\hat{i}+\hat{j}+2\hat{k}$, $2\hat{i}-\hat{j}+\lambda\hat{k}$, and $\hat{i}+\lambda\hat{j}-\hat{k}$ are coplanar.

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6. Find the projection of $\hat{i}+3\hat{j}+7\hat{k}$ on the vector $2\hat{i}-3\hat{j}+6\hat{k}$

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7. The probability distribution of discrete random variable X is given below

x	2	3	4	5
$P(x)$	$\frac{5}{K}$	$\frac{7}{k}$	$\frac{9}{k}$	$\frac{11}{k}$

find the value of K.

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8. If A and B are two events such that $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{8}$, find P (not A and not B).

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9. For what value of x , is the following matrix singular ?

$$\begin{bmatrix} 3-2x & x+1 \\ 2 & 4 \end{bmatrix}$$

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10. If $\begin{bmatrix} 2x & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix} \begin{bmatrix} x \\ 8 \end{bmatrix} = 0$, find 'x'

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11. Find maximum value of z=2x+3y subject to the constraints $x + y \leq 4, x \geq 0, y \geq 0$.

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12. For what value of 'k' the function

$$\begin{cases} kx^2, & x \leq 2 \\ 3, & x > 2 \end{cases}$$ is continuous at x=2

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13. Differentiate $\sin \sqrt{x} + \cos\left(x^2\right)$ w.r.t. x

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14. Evaluate $\int \sqrt{\frac{x}{1-x^3}}\,dx$

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15. Evaluate $\int_{-1}^{1} \left(x^7 + \tan^5 x + x + 1\right) dx$

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16. Evaluate $\int (4\cot x - 5\tan x)^2\,dx$

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17. The slope of the normal to the curve $x = a(\theta - \sin\theta), y = a(1 - \cos\theta)$ at $\theta = \frac{\pi}{2}$

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18. Show that the function given by $f(x) = 7x3$is strictly increasing on R.

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19. If the radius of a sphere is measured as 9cm with an error of 0.03 cm, then find the approximate error in calculating its volume.

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20. The radius of a balloon is increasing at the rate of 10 cm/sec. At what rate is the surface area of the balloon increasing when the radius is 15 cm?

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Section B

1. Prove that $\cos \tan^{-1} \sin \cot^{-1} x = \sqrt{\frac{x^2+1}{x^2+2}}$

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2. Solve the equation $\sin^{-1} yx + \sin^{-1} 6\sqrt{3}x = \frac{-\pi}{2}$.

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3. Using properties of determinants, prove the following:

$$|11 + p1 + p + q23 + 2p1 + 3p + 2q36 + 3p1 + 6p + 3q| = 1$$

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4. If $2x = y^{\frac{1}{m}} + y^{-\frac{1}{m}}$, show that $(x^2 - 1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = m^2 y.$

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5. If $y = x \log\{\frac{x}{(a+bx)}]$, then show that $x^3 \frac{d^2y}{dx^2} = \left(x\frac{dy}{dx} - y\right)^2$.

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6. Evaluate: $\int \frac{x^2+1}{(x^2+4)(x^2+25)}\, dx$

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7. If the magnitude of the vector product of the vector $\hat{i} + \hat{j} + \hat{k}$ with a unit vector along the sum of vector $2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\lambda\hat{i} + 2\hat{j} + 3\hat{k}$ is equal to $\sqrt{2}$, then find the value of $'\lambda'$

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8. If $\vec{a} = 3\hat{i} + 4\hat{j} + 5\hat{k}$ and $\vec{\beta} = 2\hat{i} + \hat{j} - 4\hat{k}$, then express $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2$ such that $\vec{\beta}_1 \| \vec{\alpha}$ and $\vec{\beta}_2 \perp \vec{\alpha}$.

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9. A problem in mathematics is given to three students whose chances of solving it correctly are `1/2,1/3 and 1/4' respectively . what is the probability that only one of , them solves it correctly?

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Section C

1. Show that the function $f: R \to R$ defined by $f(x) = \frac{x}{x^2+1} \forall x \in R$ is neither one-one nor onto. Also if $g: R \to R$ is defined by $g(x) = 2x - 1$ find fog(x)

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2. Let Z be the set of all integers and R be the relation on Z defined as $R = \{(a, b); a, b \in Z,$ and $(a - b)$ is divisible by $5\}$. Prove that R is an equivalence relation.

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3. The tailors A and B are per Rs.225 and Rs.300 per day respectively. A can stitch 9 shirts and 6 pants while B can stitch 15 shirts and 6 pants per day. Form a linear programming problem to minimize the labour cost to produce atleast 90 shirts and 45 pants. Solve the problem graphically.

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4. There are three coins one is a two-headed coin having head on both faces , another is a biased , coin that coines up tails 25% of the times and third is an unbiased coin. One of the three coins is chosen at random and tossed, it

shows head what is the probability that it was a two-headed coin ?

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5. Show that the lines $\frac{x5}{4}, \frac{y-7}{4} = \frac{z+3}{-5}$ and $)x-8\frac{)}{7} = \frac{y-4}{1} = \frac{z-5}{3}$ intersect each other

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6. Find the equations of the two lines through the origin which intersect the line $\frac{x-3}{2} = \frac{y-3}{1} = \frac{z}{1}$ at angle of $\frac{\pi}{3}$ each.

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7. Prove that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$, hence evaluate $\int_0^{\pi} \frac{x \sin x}{1+\cos^2 x} dx$

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8. Evaluate $\int_1^4 (x^2 - x)\, dx$ as a limit of sums.

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9. Show that the differential equation $x\frac{dy}{dx}\sin\left(\frac{y}{x}\right) + x - y\sin\left(\frac{y}{x}\right) = 0$ is homogenous. Find

the particular solution of this differential equation, given that $x = 1$ when $y = \frac{\pi}{2}$.

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Section D

1. If $A = \begin{bmatrix} 2 & 5 & 3 \\ 3 & 4 & -2 \\ 4 & -6 & -2 \end{bmatrix}$, find A^{-1}.

Hence solve the system of equations

$$\frac{2}{x} + \frac{3}{y} + \frac{4}{z} = -3, \frac{5}{x} + \frac{4}{y} - \frac{6}{z} = 4, \frac{3}{x} - \frac{2}{y} - \frac{2}{z} = 6$$

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2. If the sum of the lengths of the hypotenues and a side of a right angled triangle is given, show that the area of the triangle is maximum when the angle between them is $\pi/3$.

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3. Find the volume of the larges cylinder that can be inscribed in a sphere of radius r

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4. Sketch the graph of $y = x + 1 \in [0, 4]$ and determine the area of the region enclosed by the curve, the x-axis and

the lines $x = 0,\ x = 4$.

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5. Find image of point $(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$.

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6. Find the foot of perpendicular drawn from the point P (1,2,3) on the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{7-z}{2}$. Also find the equation of the plane containing the line and the point (1,2,3).

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