MATHS

BOOKS - ARIHANT PRAKASHAN

VERY SIMILAR TEST 7

Section A 10 Marks

1. Write the set of points, where the function $f(x)=x^3$ has relative (local) extreme.

2. Evaluate $\int_0^{\pi/2} e^x(\sin x-\cos x)dx$.

3. Write the order and degree of the differential equation in $\frac{d^2y}{dx^2} = y$

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4. Write a vector normal to $\hat{i} + \hat{k}$ and $\hat{i} + \hat{j}$.

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5. Find the distance between the parallel planes 3x - 2y + 6z - 7 = 0 and 3x-2y + 6z + 14 = 0.

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6. Consider f : (1,2,3) $\rightarrow$ {a,b,c} given by f(1) = a, f(2)=b, f(3) = c . Find f^{-1}.

Show that $\left(f^{-1}\right)^{-1}$ = f.

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7. Find the domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$.

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8. For what value of λ, the matrix

$\begin{bmatrix} 1 & \lambda & 0 \\ 3 & -1 & 2 \\ 4 & 1 & 5 \end{bmatrix}$ is singular ?

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9. Two cards are drawn from a pack of 52 cards, find the probability that they are of different suits.

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10. Examine the continuity for function f(x) = $\dfrac{1}{x+3}, x \in R$.

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Section B 60 Marks

1. Evaluate $\tan\left(\sin^{-1}\frac{3}{5}+\cot^{-1}\frac{3}{2}\right)$.

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2. One kind of cake requires 200 g of flour and 25 g of fat and another kind of cake requires 100 g of flour and 50 g of fat. The maximum number of cakes which can be made from 5 kg of flour and 1 kg of fat assuming that there is no shortage of the other ingredients used in making the cakes, formulate the problem as LPP.

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3. Let * be a binary operation on Q defined by $a * b = ab + 1$. Determine whether * is commutative but not associative.

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4. Let A = R-{2} and B = R - {1}. If f : A $\rightarrow$ B is a function defined by f(x)= $\frac{x-1}{x-2}$ then show that f is one-one and onto. Hence, find f^{-1}.

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5. Prove that following

$$\cot^{-1}\left(\frac{xy+1}{x-y}\right)+\cot^{-1}\left(\frac{yz+1}{y-z}\right)+\cot^{-1}\left(\frac{zx+1}{z-x}\right)=0, (0 < xy, yz,$$

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6. There are 25 tickets bearing numbers from 1 to 25. One ticket is drawn at random. Find the probability that the number on it is a multiple of 5 or 6.

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7. IF $A=\begin{bmatrix}1 & \tan x \\ -\tan x & 1\end{bmatrix}$ then show that $A^T A^{-1}=\begin{bmatrix}\cos 2x & -\sin 2x \\ \sin 2x & \cos 2x\end{bmatrix}$

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8. Show that the following systems of linear equations is consistent and also find their solution by using inverse of a matrix,

$x + 2y = 2$ and $2x + 3y = 3.$

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9. If A+B+C = π, prove that

$$\begin{bmatrix} \sin^2 A & \cot A & 1 \\ \sin^2 B & \cot B & 1 \\ \sin^2 C & \cot C & 1 \end{bmatrix} = 0$$

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10. Find the probability distribution of number of doublets in four throws of a pair of dice. Find also the mean and the variance of the number of doublets.

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11. Find the equasion of the tangents drawn from the point (1,2) to the curve.

$y^2 - 2x^3 - 4y + 8 = 0$

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12. Find the intervals in which the function

$y = \sin x, x \in [0, 2\pi]$ is increasing and decreasing.

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13. If $y = (\sin^{-1} x)^2$, prove that

$(1 - x^2)y_2 - xy_1 - 2 = 0$

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14. Differentiate $\log_{10} x + \log_x 10 + \log_x x + \log_{10} 10.$

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15. Verify the LMVT for the function $f(x) = \frac{1}{4x-1}, 1 \leq x \leq 4.$

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16. Find the solution of the differential equation.

$(x - y - 2)dx + (x - 2y - 3)dy = 0$

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17. Find the differential equation by eleminating the orbitary constants in the curve $ax^2 + by = 1.$

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18. Evaluate the following integrals :

$\int \frac{e^{6 \log x} - e^{5 \log x}}{e^{4 \log x} - e^{3 \log x}} dx.$

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19. Prove that $\int_{-1}^{1} \log\left(\frac{2-x}{2+x}\right) dx = 0$

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20. Find the area enclosed bt the two paraboles $y^2 = 4$ ax and $x^2 = 4$ay.

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21. By computing shortest distance, determine whether the following pair of lines intersect or not $\vec{r} = \left(4\hat{i} + 5\hat{j}\right) + \lambda\left(\hat{i} + 2\hat{j} - 3\hat{k}\right)$ and $\vec{r} = \left(\hat{i} - \hat{j} + 2\hat{k}\right) + \mu\left(2\hat{i} + 4\hat{j} - 5\hat{k}\right)$.

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22. Find the equation of the plane Paralel to the plane $2x - y + 3z + 1 = 0$ and at a distance 3 units away from it.

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23. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three mutually perpendicular vectors of equal magnitude, then find the angle between $\vec{a}$ and $\left(\vec{a}+\vec{b}+\vec{c}\right)$.

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24. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three vectors, such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$, then prove that $\vec{a}\times\vec{b}=\vec{b}\times\vec{c}=\vec{c}\times\vec{a}$.

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25. If $\hat{a}$, $\hat{b}$, $\hat{c}$ are unit vectors and $\hat{a}\times\left(\hat{b}\times\hat{c}\right)=\frac{1}{2}\hat{b}$, then find the angles that $\hat{a}$ makes with $\hat{b}$ and $\hat{c}$ where $\hat{b}$, $\hat{c}$ are not parallel.

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50. If $\hat{a}, \hat{b}, \hat{c}$ are unit vectors and $\hat{a}\times\left(\hat{b}\times\hat{c}\right)=\frac{1}{2}\hat{b}$, then find the angles that $\hat{a}$ makes with $\hat{b}$ and $\hat{c}$ where $\hat{b}, \hat{c}$ are not parallel.

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Section C 30 Marks

1. If cos y = x cos(a+y) then prove that

$$\frac{dy}{dx}=\frac{\cos^2(a+y)}{\sin a}$$

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2. Show that the semi-vertical angle of right circular cone of given surface area and maximum volume is $\operatorname{cosec}^{-1}(3)$.

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3. Find the area of the region bounded by the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1.$

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4. Find the solutions of the following differential equations :

$$x \sin \frac{y}{x} dy = \left(y \sin \frac{y}{x} - x\right) dx$$

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5. $\int \frac{\cos x - \sin x}{\sqrt{8 - \sin 2x}} dx$

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6. Find the distance of the point (1, -2, 3) from the plane $x - y + z = 5$ measured parallel to the line whose direction cosines are proportional to (2, 3, -6).

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7. Find the points on the line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ at a distance of 5 units from the point P(1, 3, 3).

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8. Solve equation $3\tan^{-1}\frac{1}{\left(2+\sqrt{3}\right)} - \tan^{-1}\frac{1}{x} = \tan^{-1}\frac{1}{3}$

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9. Solve the following LPP graphically

Maximize, $Z = 5x_1 + 3x_2$

Subject to $3x_1 + 5x_2 \leq 15$

$5x_1 + 2x_2 \leq 10$

$x_1, x_2 \geq 0$

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10. Show that the operation * given by x*y=x+y+ -xy is a binary oeration on Z,Q and R but not on N.

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11. Examining consistency and solvability, solve the following equation by matrix method.

x+2y-3z=4

2x+4y-5z=12

3x-y+z=3

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12. From a survey conducted in a cancer hospital it is found that 10% of the patients were alcoholics, 30% chew gutka and 40% have no specific carcinogenic habits. If cancer strikes 80% of the smokers, 70% of alcoholics, 50% of the non specific, then estimateic the probability that a cancer patient chosen from any one of the above types, selected at random,

is a smoker

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is alcoholic

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has no specific carcinogenic habits.

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16. Find the inverse of matix $A = \begin{bmatrix} 1 & 2 & 4 \\ -1 & -2 & -1 \\ 2 & 1 & -1 \end{bmatrix}$ by elementary transformation method and verify that "AA"^(-)=I`.

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20. Find the solutions of the following differential equations :

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26. Show that the operation * given by x*y=x+y+ -xy is a binary oeration on Z,Q and R but not on N.

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27. Examine consistency and solvability, solve the following equations by matrix method.

$x + 2y + 3z = 14$

$2x - y + 5z = 15$

and $2y + 4z - 3x = 13$

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