MATHS MATHS MATHS MATHS MATHS MATHS MATHS Tanya Wadhwa MATHS

Maths

XII - B

CODE – 041 (S) B

Bhathnagar Int. schol.

Time: 3hrs **M.M.: 100**

General Instructions:

i) **All questions are compulsory**

ii) **The question paper consist of 26 questions divided into three sections: A, B and C. Section A comprises of 6 questions of one mark each. Section B comprises of 13 questions of four marks each and Section C comprises of 7 questions of six marks each.**

iii) **All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the questions.**

iv) **There is no overall choice. However internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternative in all such questions.**

v) **Use of calculator is not permitted. You may ask for logarithmic tables and graph paper if required.**

1 42 52 6 100

13/52 52

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SECTION A

(Question 1 to 6 carry 1 mark each)

1. If $f: R \to R$ and $g: R \to R$ and $f(x) = x^2 + 1$ and $g(x) = \sin x$ then find gof.

2. Construct a 2 x 2 matrix $A = [aij]$ whose elements aij are given by $aij = \frac{(i-j)^2}{2}$.

3. The value of $sin\left(\frac{1}{4}sin^{-1}\frac{\sqrt{63}}{8}\right)$ is:

$sin\left(\frac{1}{4}\ sin\ \sqrt{\frac{63}{8}}\right)$

a) $\frac{1}{\sqrt{2}}$ b) $\frac{1}{\sqrt{3}}$ c) $\frac{1}{2\sqrt{2}}$ d) None of these

4. Show that all elements of main diagonal of skew – symmetric matrix are zeros?

5. Find an angle θ, which increases twice as fast as its Sine.

6. If $A = \begin{bmatrix} 3 \\ 5 \\ 2 \end{bmatrix}$ & $B = \begin{bmatrix} 1 & 0 & 4 \end{bmatrix}$. Find $(AB)^1$

BODMAS
bracket open
division
multiplication
addition
subtraction

$26 - 8 + 5(7-8)$

$= 26 - 8 + 5(-1)$

$= 26 - 8 - 5$

$= 13$

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SECTION B

(Question 11 to 22 carry '4' marks each)

7. If $f(x) = \begin{cases} \frac{\sqrt{1+px} - \sqrt{1-px}}{x} & if \quad -1 \le x < 0 \\ \frac{2x+1}{x-2} & if \quad 0 \le x \le 1 \end{cases}$ is continuous, then find value of 'p'

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8. Show that the curves $4x = y^2$ and $4xy = k$ cut a right angles, if $k^2 = 512$

OR

Prove that the function $f(x) = x^2 - x + 1$ is neither increasing nor decreasing on $(-1, 1)$

9. If $x = sin\left(\frac{1}{a}\log y\right)$ then show that $(1-x^2)y_2 - xy_1 - a^2 y = 0$

10. Solve the differential equation:

$$(1+x^2)\frac{dy}{dx} + 2xy = \frac{1}{1+x^2}\text{, given that}$$

y = 0 when x=1

OR

Integrate

$$\int \frac{x^2}{(x\,Sin\,x + \cos x)^2}\,dx$$

11. Prove that $2\tan^{-1}\left(\sqrt{\frac{a-b}{a+b}}\,\tan\theta/2\right) = \cos^{-1}\left(\frac{a\,Cos\,\theta + b}{a + b\,Cos\,\theta}\right)$

12. Integrate $\int \frac{dx}{\sin x + sec\,x}$

13. Show that

$$\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ bc & ca & ab \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix}$$

$= (a - b)(b - c)(c - a)(ab + bc + ca)$

14. If $A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ then prove that $(aI + bA)^n = a^n I + na^{n-1}bA$ where $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

and n is a positive integer n.

OR

Solve initial value problem

$(x + y + 1)^2\,dy = dx$; $y(-1) = 0$

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15. Integrate

(i) $\int \tan(x-\theta)\tan(x+\theta)\tan 2x\,dx$

(ii) $\int \sqrt{\{1+2\tan x(\tan x+\sec x)\}}\;dx$

16. Integrate $\int_{-1}^{1} e^{x}dx$ limits as a sum

OR

Integrate $\int \frac{dx}{\sqrt{\sin^3 x\,\sin(x+\alpha)}}$

17. The total cost of providing x radio sets per day is Rs. $\left(\frac{x^2}{4}+35x+25\right)$ and the price per set at which they may be sold is Rs $\left(50-\frac{x}{2}\right)$. Find the daily output to maximize the total profit.

18. If $x\sqrt{1+y}+y\sqrt{1+x}=0$ then prove that

$$\frac{dy}{dx}=-\frac{1}{(1+x)^2}$$

19. Show that $f(x)=x^2$ is differentiable at $x=1$ and find $f^{1}(1)$

SECTION C

(Question 20 to 26 carry '6' marks each)

20. Find the area of the greatest isosceles triangle that can be inscribed in a given ellipse having its vertex coincident with one end of the major axis.

21. Find the area of the region $\{(x,y): y^2 \le 4x;\, 4x^2+4y^2 \le 9\}$ Marks will be adjusted

22. If $x=\sqrt{a^{\sin^{-1}t}}$; $y=\sqrt{a^{\cos^{-1}t}}$; $a>0$

and $-1<t<1$ then show that $\frac{dy}{dx}=-\frac{y}{x}$

23. If $A=\begin{bmatrix}3 & -1 & -2\\ 2 & 0 & -1\\ 3 & -5 & 0\end{bmatrix}$ Find A^{-1} through elementary row transformation method.

OR

Solve the initial value problem

$(1+y^2)\,dx=(\tan^{-1}y-x)\,dy;\; y(0)=0$

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24. Show that the function f in $A = R - \left\{\frac{2}{3}\right\}$ defined as $f(x) = \frac{4x+3}{6x-4}$ is one – one and onto.

Hence find f^{-1}.

25. Integrate $\int \frac{x^2+1}{(x-1)^2(x+3)}\,dx$

OR

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B 10

Determine the product

$$\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$$ and use it to solve the system of equation

$x - y + z = 4;\;\; x - 2y - 2z = 0\;;\; 2x + y + 3z = 1$

26. From differential equation representing the family of ellipses having centre at the origin and foci on x –axis.

OR

If $A = \begin{bmatrix} 3 & 2 & 0 \\ 1 & 4 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ then show that $A^2 - 7A + 10\, I_3 = 0$ and hence find A^{-1}.

$x - y + z = 4$

$-\; x - 2y - 2z = 0$

$y + 3z = 4$

~~40~~	~~30~~	20	10
~~39~~	~~29~~	19	9
~~38~~	~~28~~	18	8
37	27	17	7
36	26	16	6
35	25	15	5
34	24	14	4, 4
33	23	13	3
32	22	12	2
31	21	11	1

$4 - \frac{10}{3} = 4$

$2x + 4 = 1$

$x = \frac{-3}{2}$

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