ગુજરાત માધ્યમિક અને ઉચ્ચતર માધ્યમિક શિક્ષણ બોર્ડ, ગાંધીનગર

For Academic year 2020-21
Std. 12 : Maths (050) (Science Stream)
Annual Exam
PAPER SCHEME

Time : 3 hrs. **Total marks : 100**

Note : This Paper scheme acts as guideline to teachers, paper-setter, moderators etc. Along with tjhe aims of Secondary and Higher Secondary Education, there is a spar to make some changer in question paper for paper setter as well as moderator as per subject.

Weightage as per objective :

Objectives	Knowledge	Understanding	Application	Higher order thinking skill		Total
				Synthesis/ Analysis	Inference/ Evaluative	
Part-A Mark	10	15	13	10	02	50
Part-B Mark	10	15	13	09	03	50
Total Mark (%)	**20**	**30**	**26**	**19**	**05**	**100**

Marks as per type of question : PART-A

No.	Type of Question	No. of Question	Total Marks
1.	Objective	50	50

Marks as per type of question : PART-B

No.	Type of Question	Without Option	With Option	Total Marks
1.	Short Answer Type (SA-I)	08	12	16
2.	Short Answer Type (SA-II)	06	09	18
3.	Long Answer Type (LA)	04	06	16
	Total	**18**	**27**	**50**

Makes as per type of Question (PART-A):

No.	Name of Chapter	Chapterwise weightage				Unitwise weightage	
		Without Option		Part-B		Unitwise Mark	Unitwise Weightage
		Part-A	Part-B	Optional Mark	Total Marks with Option		
1.	Relations and Functions	3	3(1)		6	U-1	
2.	Inverse Trigonometric Functions	4	2(1)	2(1)*	8	12	14
3.	Matrix	4	3(1)	4(1)*	11	U-2	
4.	Determinants	3	4(1)	3(1)*	10	14	21
5.	Continues and Differentiability	3	3(1), 2(1)	4(1)*	12	U-3	
6.	Application of Derivatives	4	4(1)	3(1))*	11		
7.	Integrates	8	4(1), 2(1)		14	44	53
8.	Application of Integrates	3	2(1), 2(1)		07		
9.	Differential Equations	3	4(1)	2(1)*	09		
10.	Vector Algebra	6	2(1)	3(1)*	11	U-4	
11.	Three Dimensional Geometry	3	3(1), 2(1)	2(1)*	10	16	21
12.	Linear Programiny	3	3(1)		06	U-5, 06	06
13.	Probability	3	3(1), 2(1)	2(1)*	10	U-6, 08	10
	Total Marks	**50**	**50(18)**	**25(9)***	**125**	**100**	**125**

Std. 12 : (Science Stream) Maths (050)
Annual Exam
Scheme of Paper

Time : 3 hrs. **Total marks : 100**

No. of Question	Details of Section / Question	Marks
	PART - A	
1 to 50	50 Multiple Choice Questions, each of 1 mark	50
	PART - B	
	SECTION - A	
1 to 8	12 Short Answer type questions, Each carries 2 marks • Attempt any 8 questions. (SA-I)	16
	SECTION - B	
9 to 14	Short Answer type Questions, Each carries 3 marks • Attempt any 6 questions. (SA-II)	18
	SECTION - C	
15 to 18	Long Answer Type Questions, Each carries 4 marks • Attempt any 4 questions. (LA)	16
	Total Marks	**100**

Note :
- Time first one hour for Part-A
- Time remaining two hours for part-B

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Std. 12 (Science Stream) Maths-050

Annual Examination

Sample Paper

Time : 3 Hours **Total Marks : 100**

Time : 1 Hours **Total Marks : 50**

Instructions : (1) There are 50 objective type (MCQ) questions in Part-A and all questions are compulsory.

(2) The questions are serially numbered from 1 to 50 and each carries 1 mark.

(3) Read each question carefully, select proper option and answer in the OMR Sheet.

(4) The OMR Sheet is given for answering the questions. The answer of each circle (●) of the correct answer with ball-pen.

(5) Rough work is to be done in the space provided for this purpose in the Test Booklet only.

(6) Set No of question paper printed on the upper most right side of the question paper is to be written in the column provided in the OMR Sheet.

PART - A

(1) Relation R = {(1,1), (2,2) (3,3) (1,2) (2,3)} in the set A={1, 2, 3} is ______.

(A) symmetric (B) Not reflexive (C) not transitive (D) an equivalnce

(2) Number of binary operations an the set {p, q, r } are ________.

(A) 9 (B) 3^{27} (C) 3^9 (D)2^9

(3) Let $f : NxN \rightarrow N - \{1\}, f(x, y) = x+y$ is __________

(A) neither one-one nor onto (B) one-one and onto

(C) one-one but not onto (D) not one-one but onto

(4) The Principle value of $\cot^{-1}\left(-\sqrt{3}\right)$ is __________

(A) $\frac{5\pi}{6}$ (B) $\frac{\pi}{6}$ (C) $\frac{2\pi}{3}$ (D) $-\frac{\pi}{6}$

(5) If $Sin^{-1} x = y, \ x \in [0, 1]$ then __________

(A) $0 \le y \le \frac{\pi}{2}$ (B) $0 \le y \le \pi$ (C) $\frac{\pi}{2} \le y \le \pi$ (D) $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$

(6) $Sin\ (Sec^{-1} x + cosec^{-1} x) =$ __________ (Where $|x| \ge 1$)

(A) 0 (B) 1 (C) $\frac{1}{\sqrt{2}}$ (D) -1

(7) $Sin^{-1}\ (Sin\ 3) =$ __________

(A) 3 (B) $\pi - 3$ (C) $3 - \pi$ (D) π

(8) Which of the given values of x and y make the following pair of matrices equal

$\begin{bmatrix} 3x+7 & 5 \\ y+1 & 2-3x \end{bmatrix}$, $\begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix}$

(A) $x=\frac{-1}{3}, y=7$ (B) Not possible to find (C) $y=7,\ x=\frac{-2}{3}$ (D) $x=\frac{-1}{3},\ y=-\frac{2}{3}$

(9) If $A=\begin{bmatrix} Cos\alpha & -Sin\alpha \\ sin\alpha & Cos\alpha \end{bmatrix}$ and $A+A^{1}+\sqrt{3}\,I=O$, than the value of $\propto$ is = ______________

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{2\pi}{3}$ (D) $\frac{5\pi}{6}$

(10) For $A=\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is $A^2=$ I, then ______________

(A) $1+\alpha^2+\beta\gamma=0$ (B) $1-\alpha^2+\beta\gamma=0$ (C) $1-\alpha^2-\beta\gamma=0$ (D) $1+\alpha^2-\beta\gamma=0$

(11) If $y=\begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ and $2x+y=\begin{bmatrix} 1 & 0 \\ -3 & 2 \end{bmatrix}$, then $x=$ __________

(A) $\begin{bmatrix} -1 & -1 \\ -2 & 1 \end{bmatrix}$ (B) $-\begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} -1 & -1 \\ 2 & -1 \end{bmatrix}$ (D) $-\begin{bmatrix} 1 & 1 \\ -3 & 1 \end{bmatrix}$

(12) The area of triangle whose vertices are (3, 8) (-4, 2) and (5, 1) is ______________

(A) 61 (B) $\frac{61}{2}$ (C) $\frac{9}{2}$ (D) $\frac{89}{2}$

(13) If $A=\begin{bmatrix} 3 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 5 \end{bmatrix}$, then $A^{-1}=$ ________

(A) $\begin{bmatrix} \frac{1}{3} & 0 & 0 \\ 0 & \frac{1}{4} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$ (B) $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ (C) $\begin{bmatrix} -3 & 0 & 0 \\ 0 & -4 & 0 \\ 0 & 0 & -5 \end{bmatrix}$ (D) $60\begin{bmatrix} \frac{1}{3} & 0 & 0 \\ 0 & \frac{1}{4} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$

(14) The cofactor of 4 for determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$ is ________

(A) 13 (B) -13 (C) 30 (D) Z7

(15) Function $f(x)$ is defined by $f(x)=\begin{cases} ax+1 & x\le 3 \\ bx+3 & x>3 \end{cases}$ is contunious at $x=3$ then ________

(A) $a-b=\frac{2}{3}$ (B) $b-a=\frac{2}{3}$ (C) $a=b+\frac{3}{2}$ (D) $a=b-\frac{3}{2}$

(16) $\frac{d}{dx}(\tan x^{0}) =$ ________

(A) $Sec^2 x^0$ (B) $Sec^2 x^0 \tan^2 x^0$ (C) $\frac{\pi}{180} Sec^2 x^0$ (D) $\frac{180}{\pi} Sec^2 x^0$

(17) If $x = a\ cos^3\Theta$ and $y = asin^3\Theta$ then $\frac{dy}{dx}$ = __________.

(A) $\tan\Theta$ (B) $-Cot\Theta$ (C) $\sqrt[3]{\frac{y}{x}}$ (D) $-\sqrt[3]{\frac{y}{x}}$

(18) If $f(x) = x^2 + a x + 1$ is increasing on [1, 2], then smallest value of a is _________

(A) -2 (B) -3 (C) -4 (D) -5

(19) The slope of normal to the curve $y = 3x^4 - 4x$ at $x = 4$ is ___________

(A) 764 (B) $\frac{-1}{764}$ (C) $\frac{-1}{674}$ (D) 1

(20) The point on the curve $x^2 = 2y$ which is nearest to the point (0, 5) is ___________

(A) $(2\sqrt{2}, 4)$ (B) $(2\sqrt{2}, 0)$ (C) $(0, 0)$ (D) $(2, 2)$

(21) The line $y = m x+1$ is a tangent to the curve $y^2 = 4x$ then $2m$ = __________

(A) 2 (B) 4 (C) 6 (D) 1

(22) If $\frac{d}{dx} f(x) = 4x^3 - \frac{3}{x^4}$ and $f(2) = 0$, then $f(x)$ = __________

(A) $x^4 + \frac{1}{x^3} - \frac{129}{8}$ (B) $x^3 + \frac{1}{x^4} + \frac{129}{8}$ (C) $x^4 + \frac{1}{x^3} + \frac{129}{8}$ (D) $x^3 + \frac{1}{x^4} - \frac{129}{8}$

(23) $\int \frac{x^5 - 1}{x - 1} dx - =$ _________ $+ c$

(A) $\sum_{i=1}^{6} \frac{x^i}{i}$ (B) $\sum_{i=1}^{4} \frac{x^i}{i}$ (C) $\sum_{i=1}^{5} \left(\frac{x^i}{i}\right)$ (D) $\sum_{i=1}^{5} (i \cdot x^i)$

(24) $\int (Cos\,x + Sin\,x)\,(1 - \frac{1}{2}\ Sin\,x\,Cos\,x)\ Sec^2 x\ Cosec^2 x\ dx$ = ________

(A) $Cosec\,x + Sec\,x$ (B) $Cosec\,x - Sec\,x$ (C) $-Cosec\,x + Sec\,x$ (D) $-Cosec\,x - cot\,x$

(25) $\int \frac{dx}{Sin^4 x \sec^2 x} dx =$ _________ $+ c$

(A) $-\frac{\cot^3 x}{3}$ (B) $\frac{\cot^3 x}{3}$ (C) $\frac{\tan^3 x}{3}$ (D) $-3\cot^3 x$

(26) $\int \frac{dx}{\sqrt{e^x - 1}} =$ _______ + C

(A) $2\sqrt{e^x - 1}$ (B) $\frac{1}{2}\sqrt{e^x - 1}$ (C) $-2\,cosec^{-1} e^{\frac{x}{2}}$ (D) $2Sec^{-1}(e^x)$

(27) $\int_{\frac{1}{3}}^{1} \frac{(x-x^3)^{\frac{1}{3}}}{x^4} dx$ નું મૂલ્ય $=$ __________

(A) 6 (B) 0 (C) 3 (D) 4

(28) $\int_{\log\frac{1}{2}}^{\log 2} \log\left(\frac{5-x}{5+x}\right) dx$ $=$ __________

(A) 0 (B) 2 log 5 (C) $\frac{1}{2}$ log 5 (D) -2 log 5

(29) $\int_{-2}^{3} |x|$ dx = ___________

(A) 0 (B) $\frac{13}{2}$ (C) $\frac{9}{2}$ (D) $\frac{15}{2}$

(30) Area bounded by $y^2 = 4x$ and its letusrectum is _____________

(A) $\frac{8}{3}a^2$ (B) $\frac{4}{3}a^2$ (C) $\frac{8}{3}$ (D) $\frac{4}{3}$

(31) Area bounded by $y = \sin x : x = -\pi$ to $x = 2\pi$ and x - axis is __________

(A) 4 (B) 6 (C) 8 (D) 2

(32) Area bounded by $4x^2 + 9y^2 = 1$ is _________

(A) 6 π (B) 12 π (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{12}$

(33) The number of arbitrary constants in the general solution of a differential equation of fourth order are ________

(A) 0 (B) 2 (C) 3 (D) 4

(34) The order and degree of differential equation $e^{\frac{d^2y}{dx^2}} = x$ are ________ respectively.

(A) 2 and not defined (B) 1 and 1

(C) 1 and 2 (D) 2 and 1

(35) The general solution of $\frac{dy}{dx} = (1 + x^2)(1 + y^2)$ is __________

(A) $\tan^{-1} x + \tan^{-1} y = C$ (B) $\tan^{-1} x - \tan^{-1} y = C$

(C) $\tan^{-1} y - x - \frac{x^3}{3} = C$ (D) $\tan^{-1} x - y - \frac{y^3}{3} = C$

(36) The magnitude of the unit vector in the opposite direction of sum of vectors $\vec{a} = 2\hat{i} + 2\hat{j} - 5\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} + 3\hat{k}$ = _______.

(A) -1 (B) 1 (C) $\sqrt{29}$ (D) $-\sqrt{29}$

(37) For vectors $\vec{a}$ and $\vec{b}$ if $|\vec{a}| = 2$ and $|\vec{b}| = 3$ and $\vec{a} \cdot \vec{b} = 4$, then $|\vec{a} - \vec{b}| =$ ________

(A) 13 (B) $\sqrt{13}$ (C) 5 (D) $\sqrt{5}$

(38) For non-null vectors $\vec{x}$ and $\vec{y}$ which one is not possible ?

(A) $|\vec{x} \cdot \vec{y}| = |\vec{x}|\ |\vec{y}|$ (B) $|\vec{x} + \vec{y}| = |\vec{x}| + |\vec{y}|$

(C) $|\vec{x} + \vec{y}| < |\vec{x}| + |\vec{y}|$ (D) $|\vec{x} + \vec{y}| > |\vec{x}| + |\vec{y}|$

(39) If vectors $\vec{a} = x\hat{i} + 2\hat{j} + z\hat{k}$ and $\vec{b} = 2\hat{i} + y\hat{j} + \hat{k}$ are equal, then $x + y - z =$ __________

(A) 5 (B) 4 (C) 3 (D) 0

(40) For non-null vectors $\vec{a}$ and $\vec{b}$ if $|\vec{a} + \vec{b}| = |\vec{a}|$ then vectors $2\vec{a} + \vec{b}$ and $\vec{b}$ are________

(A) Paralled (B) Perpendicular (C) Collinear (D) Equal

(41) If inner products of vector $\vec{a}$ with vectors $2\hat{i} + 7\hat{j}$ and $\hat{i} + \hat{j} + \hat{k}$ are -1, 6 and 5 respectively, then $\vec{a} =$ __________

(A) $3\hat{i} + 2\hat{k}$ (B) $3\hat{i} + \hat{j} + 2\hat{k}$ (C) $\hat{i} + 3\hat{j} + 2\hat{k}$ (D) $\hat{i} + \hat{j} + \hat{k}$

(42) The co-ordinates of foot of perpendicular from origin to the plane $2x - 3y + 4z - 6 = 0$ *are*____________

(A) $\left(\frac{12}{29}, \frac{-18}{29}, \frac{24}{29}\right)$ (B) $\left(\frac{12}{\sqrt{29}}, \frac{-18}{\sqrt{29}}, \frac{24}{\sqrt{29}}\right)$

(C) $\left(\frac{6}{\sqrt{29}}, \frac{-9}{\sqrt{29}}, \frac{12}{\sqrt{29}}\right)$ (D) $\left(\frac{6}{29}, \frac{-9}{29}, \frac{12}{29}\right)$

(43) If lines $\frac{x+3}{a} = \frac{y-1}{5} = \frac{z+3}{4}$ yand $\frac{x+1}{1} = \frac{4-y}{-1} = \frac{z-5}{2}$ are perpendicular, then $a =$ ________.

(A) 13 (B) -13 (C) 3 (D) -3

(44) Distance between the two planes : $2x + 3y + 4z - 4 = 0$ and $4x + 6y + 8z - 12 = 0$ is _____

(A) 2 units (B) 4 units (C) 8 units (D) $\frac{2}{\sqrt{29}}$ units

(45) Objective function of an LP problem is ________.

(A) a constant (B) a function to be optimized (C) an inequality (D) a quadratic equation.

(46) In solving the LP problems : “Maximize Z=8000 x + 12000y subject to $9x + 12y \le 180$, $3x + 4y \le 60$, $x + 3y \le 30$, $x \ge 0$ *and* $y \ge 0$” which one (point) is not a point of feasible region ?

(A) (20, 0) (B) (12, 6) (C) (12, 0) (D) (0, 15)

(47) In solving the LP problems : "Minimize Z=6x + 10y subject to $x \geq 6, y \geq 2, 2x + y \geq 10, x \geq 0,$ $y \geq 0$ redundant constraints are _______ .

(A) $x \geq 6, y \geq 2$ (B) $2x + y \geq 10, x \geq 0, y \geq 0$ (C) $x \geq 6$ (D) $x \geq 6, y \geq 0$

(48) A family has two childrens. What is the probability that both the children are boys given that at least one of them is a boy ?

(A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{2}{3}$ (D) $\frac{1}{2}$

(49) If E and F are independet events and P (E) ≠ O, P(F) ≠ O, then _____ is false.

(A) P(E/F) = P(E) (B) $P(F^1 / E) = 1 - P(F/E)$

(C) $P(E^1 / F^1) = 1 - P(E)$ (D) $P(E^1 / F^1) = 1 - P(E/F)$

(50) If four letters are inserted randomly in four covers, what is the probability that exactly three letters are in proper cover ?

(A) 0 (B) $\frac{1}{24}$ (C) $\frac{1}{3}$ (D) $\frac{1}{4}$

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Time : 2 Hours **PART-B** **Maximum Marks : 50**

Instructions :
(1) Write in a clear legible hand writing.
(2) There are three sections A, B, and C in Part-B.
(3) All the questions are compulsory and general options are given in each section.
(4) The numbers at the right side represent the marks of the sections.
(5) Start new section on new page.
(6) Maintain Sequence of questions in the section.
(7) Use of simple calculator and log table is allowed, if required.
(8) Use the graph paper in the questions of linear programming, if required.

Section-A

- **Answer any 8 questions from given following questions no. 1 to 12. (Each carry 2 marks)** **[16]**

(1) Prove that $\frac{9\pi}{8} - \frac{9}{4} Sin^{-1} \frac{1}{3} = \frac{9}{4} Sin^{-1} \frac{2\sqrt{2}}{3}$

(2) Prove that $\tan^{-1}\sqrt{x} = \frac{1}{2} Cos^{-1}\left(\frac{1-x}{1+x}\right)$, where $x \in [0, 1]$

(3) Differentiate $\sqrt{\frac{(x-3)(x^2+4)}{3x^2+4x+5}}$ w. r. t. x

(4) Find $\int \frac{(x+1)(x+\log x)^2}{x} dx$

(5) Find the area bounded by the curve $y = 4x^2$ and lines $y = 1, y = 4$

(6) Find the area lying in the first quadrant and bounded by the circle $x^2 + y^2 = 4$ and lines $x = 0, x = 2$

(7) Find the equation of a curve passing throught the point $(-2, 3)$, given that the slope of the tangent to the curve at any point (x, y) is $\frac{2x}{y}$

(8) If a unit vector $\vec{a}$ makes angle $\frac{\pi}{3}$ with $\hat{i}$, $\frac{\pi}{4}$ with $\hat{j}$ and acute angle Θ with $\hat{k}$, then find Θ and hence the components of $\vec{a}$.

(9) Determine whether the lines

$\frac{x}{2} = \frac{y}{2} = \frac{z}{1}$ and $\frac{x-5}{4} = \frac{y-2}{1} = \frac{z-8}{8}$ are coplanar or not ?

(10) Find the shortest distance between the lines whose vector equations are

$\vec{r} = (1-t)\,\hat{i} + (t-2)\,\hat{j} + (3-2t)\,\hat{k}$ and $\vec{r} = (s+1)\,\hat{i} + (2S-\hat{1})\,j - (2s+\hat{1})\,k$

(11) Three cards are drawn successively without replacement from a pack of 52 well shuffled cards. What is the probability that first two cards are kings and the third card drawn is an ace ?

(12) Evaluate $P(A \cup B)$, if $2P(A) = P(B) = \frac{5}{13}$ and $P(A/B) = \frac{2}{5}$

Section-B

- **Answer any 6 questions from given following question no. 12 to 21. [18]**
  (Each carry 3 makrs)

(13) Show that the function $f: R^* \rightarrow R^*$, defind by $f(x)=\frac{1}{x}$ is one-one and onto, where R* is the set of all non-zero real numbers. Is the result true, if the domain R* is replaced by N with Co-domain being same as R* ?

(14) Let $A=\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}, B=\begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}, C=\begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$. Find a matrix D such that CD – AB=O where O is 2 x 2 zero matrix.

(15) If $A=\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = O$. Hence find A^{-1}.

(16) If $y = (\tan x)^2$, show that $(x^2+1)^2 y_2 + 2x(x^2+1) y_1 = 2$.

(17) Find the intervals in which the function *f* given by $f(x) = 2x^3 - 3x^2 - 36x + 7$ is *(a)* strictly increasing *(b)* strictly decreasing.

(18) If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$ are such that, $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$, then find the value of λ.

(19) Find the vector equation of the linear passing through the point (1, 2, -4) and perpendicular to the two lines : $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$

(20) Solve the following lines programming problem graphically,

Minimize and Maximize $z = 9x + 3y$

Subject to the constraints : $x+3y \leq 60$, $x + y \geq 10$, $x \leq y$, $x \geq 0$, $y \geq 0$.

(21) Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls. Find the probability that

(i) both balls are red.

(ii) First ball is black and second is red.

Section-C

- **Answer any 4 questions from given following question no. 22 to 27.**
  (Each carry 4 marks) [16]

(22) Express the matrix $B=\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

(23) Show that

$$\Delta = \begin{vmatrix} (y+z)^2 & xy & zx \\ xy & (x+z)^2 & yz \\ xz & yz & (x+y)^2 \end{vmatrix} = 2xyz(x+y+z)^3$$

(24) Find $\dfrac{dy}{dx}$, if $y^x + x^y = a^b$.

(25) A rectangular sheet of tin 45 cm by 24 cm is to be made into a box without top, by cutting off square from each corner and folding up the flaps. What should be the side of the square to be cut off so that the volume of the box is maximum ?

(26) Evaluate $\displaystyle\int_0^{\pi} \frac{xdx}{a^2\cos^2 x + b^2 Sin\, x}$

(27) Solve the differential equation.

$$\frac{dy}{dx} + \frac{y(x+y)}{x^2} = 0$$

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