Bharati Vidyapeeth Institute of Technology

Navi Mumbai

A Workbook for

BASIC MATHEMATICS (BMS)

(22103)

Semester- 1(I) (20 - 20)

Diploma in All Courses

Name of Student :……

Program & Year :……..

Roll No :……..

COURSE OUTCOMES (CO)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

CO1. Apply the concepts of algebra to solve engineering related problems.

CO2. Utilize basic concepts of trigonometry to solve elementary engineering problems.

CO3. Solve basic engineering problems under given conditions of straight lines.

CO4. Solve the problems based on measurement of regular closed figures and regular solids.

CO5. Use basic concepts of statistics to solve engineering related problems.

List of Tutorials

Academic Year: **Name of Faculty:**

Course code: **Subject Code: BMS** (22103)

Name of candidate: **Enroll no.**

Roll no. **Semester:** 1 (I)

Sr. No.	Title	Date of performance	Date of submission	Sign of Teacher
1	**ALGEBRA: LOGARITHMS.**			
2	**ALGEBRA : DETERMINANTS**			
3	**ALGEBRA : MATRICES**			
4	**ALGEBRA : PARTIAL FRACTIONS**			
5	**TRIGONOMETRY: ALLIED, COMPOUND & MULTIPLE ANGLES**			
6	**TRIGONOMETRY: MULTIPLE, SUBMULTIPLE ANGLES, FACORIZATION & DEFACORIZATION PROBLEMS**			
7	**TRIGONOMETRY: INVERSE TRIGONOMETRIC FUNCTION**			
8	**CO-ORDINATE GEOMETRY: STRAIGHT LINE**			
9	**MENSURATION: AREA, SUFACE AREA & VOLUME**			
10	**STATISTICS: MD, SD & VARIACNCE**			

Assignment 1

(Logarithm)

Q 1 Write all Properties of Logarithm

Q 2 *Evaluate*: $(25)^{-\log_5 3}$

Q 3 *Prove that* $\frac{1}{\log_{pq} pqr} + \frac{1}{\log_{qr} pqr} + \frac{1}{\log_{pr} pqr} = 2$

Q 4 $Solve\ \log_5(2x+4)=2$

Q 5 $Solve\ \log_3 x+\frac{3}{\log_3 x}=4$

Q 6 Prove That $2\log\frac{5}{3}-\log\frac{25}{16}+2\log\frac{3}{4}=0$

Q 7 $Prove\ that\ \frac{\log a^3}{\log abc} + \frac{\log b^3}{\log abc} + \frac{\log c^3}{\log abc} = 3$

Q 8 $If\ a^2 + b^2 = 7ab\ \ then\ show\ that\ \log\left(\frac{a+b}{3}\right) = \frac{1}{2}(\log a + \log b)$

Assignment 2

(Determinant)

Q 1. Solve the following:

a) $\begin{vmatrix} 3 & -5 \\ 4 & 7 \end{vmatrix} =$

b) $\begin{vmatrix} 1 & -2 & 3 \\ -2 & 5 & 6 \\ 4 & 0 & -4 \end{vmatrix} =$

Q 2. Solve for x:

a) $\begin{vmatrix} x & 6 \\ 2 & -3 \end{vmatrix} = 4$

b) $\begin{vmatrix} 5 & x & 4 \\ -1 & 0 & 6 \\ -4 & 3 & 2 \end{vmatrix} = 0$

Q 3. Solve the following simultaneous equations by using Cramer's rule.

a) $3x + 5y - 2z = 6; \quad 2x - 3y + 4z = 3; \quad x + 2y + 4z = 7$

Q 4. $x + 2y - z = 2; \quad 3x - y + 2z = 7; \quad 2x + 2y + z = 9$

Q 5. *Find the area of the triangle formed by the points* $(2,-1),(-3,4)$ *and* $(5,2)$

Q 6. *Find the area of the Quadrilateral formed by the points* $(1,1),(5,2),(4,4)$ *and* $(2,3)$.

Assignment 3

(Matrices)

Q 1 $If\ A = \begin{bmatrix} 1 & -2 & 3 \\ -1 & 2 & 1 \end{bmatrix}, B = \begin{bmatrix} 2 & 3 \\ 3 & 1 \\ 1 & 2 \end{bmatrix},\ find$ the matrix AB − 3I, where I is unit matrix.

Q 2 If $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ Show that $A^2 = A$.

Q 3 $If\ A = \begin{bmatrix} 2 & -2 \\ 3 & 1 \end{bmatrix},\ B = \begin{bmatrix} -1 & 5 \\ 4 & -3 \end{bmatrix},\ C = \begin{bmatrix} 7 & -5 \\ 0 & 5 \end{bmatrix}$ Verify that (AB) C = A (BC).

Q 4 $Find\ x,y,z\ if\ \left\{\begin{bmatrix}1 & 3 & 2\\ 2 & 0 & 1\\ 3 & 1 & 2\end{bmatrix}+2\begin{bmatrix}3 & 0 & 2\\ 1 & 4 & 5\\ 2 & 1 & 0\end{bmatrix}\right\}\begin{bmatrix}1\\ 2\\ 3\end{bmatrix}=\begin{bmatrix}x\\ y\\ z\end{bmatrix}$

Q 5 Show that the matrix $A=\begin{bmatrix}\cos\theta & 0 & \sin\theta\\ 0 & 1 & 0\\ -\sin\theta & 0 & \cos\theta\end{bmatrix}$ *is an orthogonal matrix.*

Q 6 $If\ A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 2 \\ 4 & 5 & 0 \end{bmatrix}\ and\ B = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}\ verify\ that\ (AB)^T = B^T A^T$

Q 7 *Find inverse of the matrix* $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$

Q 8 *Using matrix inversion method, solve the equations:*

$$x + 3y + 3z = 12, \qquad x + 4y + 4z = 15, \qquad x + 3y + 4z = 13$$

Q 9 *Using matrix inversion method, solve the equations:*

$$x + y + z = 6, \qquad 3x - y + 3z = 10, \qquad 5x + 5y - 4z = 3$$

Assignment 4

(Partial Fraction)

Q 1 *Resolve into Partial Fractions:* $\frac{3x-1}{(x-4)(2x+1)(x-1)}$

Q 2 *Resolve into Partial Fractions:* $\frac{x^2+1}{x(x^2-1)}$

Q 3 *Resolve into Partial Fractions:* $\frac{1}{(x+1)^2(x+2)}$

Q 4 *Resolve into Partial Fractions:* $\frac{x}{x^3-1}$

Q 5 *Resolve into Partial Fractions:* $\frac{\sin\theta+1}{(\sin\theta+2)(\sin\theta+3)}$

Q 6 *Resolve into Partial Fractions:* $\frac{e^x}{e^{2x}+4e^x+3}$

Q 7 *Resolve into Partial Fractions:* $\frac{x^3+2}{x^2-1}$

Assignment 5

(Trigonometric Functions of Allied and Compound Angles)

Q 1 $Prove\ that: \sin(A+B)\sin(A-B) = cos^2 B - cos^2 A.$

Q 2 $If\ \tan(x+y)=\frac{3}{4}\ and\ \tan(x-y)=\frac{8}{15},\ show\ that \tan 2x=\frac{77}{36}.$

Q 3 $Prove\ that: \cos(510^0).\cos(330^0)+\sin(390^0)\cos(120^0)=-1$

Q 4 Prove that $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$

Q 5 Prove that $\frac{1 - \tan 2\theta \tan \theta}{1 + \tan 2\theta \tan \theta} = \frac{\cos 3\theta}{\cos \theta}$

Q 6 $Prove\ that: \frac{\cos 3\theta}{\cos \theta} + \frac{\sin 3\theta}{\sin \theta} = 4\cos 2\theta$

Q 8 $In\ \Delta ABC\ prove\ that\ \tan A + \tan B + \tan C = \tan A \tan B \tan C$

Q 9 *Prove that* $1 + \tan A \tan 2A = \sec 2A$

Q 10 Define :

1) Compound angle

2) Allied Angle

Assignment 6

(Trigonometric Functions of Multiple & Sub-Multiple Angle, Factorization & De-Factorization Formula)

Q 1 $Prove\ that: \cos 2\theta = 1 - 2\sin^2\theta$

Q 2 $If\ \cos A = 0.4, find\ the\ value\ of \cos 3A.$

Q 3 $Prove\ that: \frac{\sin 4\theta + \sin 2\theta}{1+\cos 2\theta + \cos 4\theta} = \tan 2\theta.$

Q 4 $Prove\ that: \sin 3A = 3\sin A - 4\sin^3 A.$

Q 5 $Prove\ that: \sqrt{2+\sqrt{2+\sqrt{2+2\cos 4\theta}}} = 2\cos\theta$

Q 6 $If\ \ 2\sin 40^0 . \cos 10^0 = \sin A + \sin B,\ \ find\ A\ and\ B.$

Q 7 $Prove\ that: \frac{\sin 7x + \sin x}{\cos 5x - \cos 3x} = \sin 2x - \cos 2x \,.\, \cot x$

Q 8 $Prove\ that: \cos 10^0 \,.\, \cos 50^0 \,.\, \cos 70^0 = \frac{\sqrt{3}}{8}$

Q 9 $Prove\ that: \frac{\sin A + \sin 2A + \sin 3A + \sin 4A}{\cos A + \cos 2A + \cos 3A + \cos 4A} = \tan\left(\frac{5A}{2}\right).$

Q 10 $Prove\ that: \frac{\sin 19^0 + \cos 11^0}{\cos 19^0 - \sin 11^0} = \sqrt{3}$

Assignment 7

(Inverse Trigonometric Functions)

Q 1 *Prove that* : $2\sin^{-1}x = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$.

Q 2 *Find the principle value of* : 1) $\cos^{-1}\left(-\frac{1}{2}\right)$ 2) $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$ 3) $\tan\left[2\tan^{-1}\left(\frac{1}{5}\right)\right]$

Q 3 *Find the value of* $\cos\left[\sin^{-1}\left(\frac{3}{5}\right)+\sin^{-1}\left(\frac{5}{13}\right)\right]$

Q 4 *Prove that* : $\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{3}\right)=\frac{\pi}{4}$

Q 5 $Prove\ that : \cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$

Q 6 $Prove\ that : \tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$

Assignment 8

(Straight Line)

Q 1 *State the conditions of parallel and perpendicular lines, whose slopes are* m_1 *and* m_2.

Q 2 *Find intercepts of a line* $2x + 3y = 6$ *on co − ordiante axis.*

Q 3 *Find the equation of a straignt line that passes through* $(3,4)$ *and perpendicular to the line* $3x + 2y + 5 = 0$.

Q 4 *Find the equation of a straignt linewhich passes through the point of intersection of the lines* $2x + 3y = 13, 5x - y = 7$ *and perpendicular to the line* $2x - 5y + 9 = 0$.

Q 5 *Find the lengh of perpendicular from the point* $(3,2)$ *on the line* $4x - 6y - 5 = 0$.

Q 6 *Find theequation of straight line passing through the points* $(-4,6)$ *and* $(8,-3)$.

Q 7 *Find theequation of the straight line passing through* $(-3,10)$ *and sum of their intercepts is* 8.

Q 8 *Find the acute angle between the lines* $2x + 3y = 13$ *and* $2x - 5y + 7 = 0$

Q 9 *Prove that if θ is the acute angle between the lines with slopes*

m_1 *and* m_2 *then* $\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$

Q 10 *Find the perpendicular distance between the parallel lines*

$5x - 12y + 1 = 0$ *and* $10x - 24y = 1.$

Assignment 9

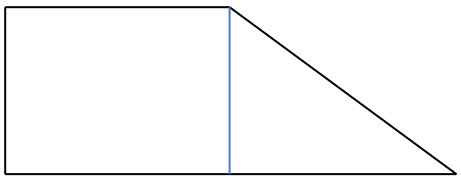
(Mensuration)

Q 1 *How many tiles, each measuring 2m by 0.7m, are required to cover a rectangular hall 12m long and 8m broad? Find the cost of tiles at 25 Rs. per tile.*

Q2

A retaining wall carries its two horizontal parallel sides 3m and 6.7m which are 2.25m apart.

Calculate the area of the wall.



Q 3 Find the Capacity of a Cylindrical Water Tank whose diameter is 4m and height is 5.2m.

Q 4 *Find the area of a circle whose radius is equal to the side square with area* $196\ cm^2$

Q 5 *Find the total surface area of a cube if its volume is* 216 cm^3

Q 6 *The diameter of a wheel is* 280 *cm.* It roles through a distance of 44m. Find the Number of Revolutions made by the wheel.

Q 7 *Find the surface area of solid cylinder with radius 7 cm and height 28 cm.*

Q 8 *How much canves cloth will be required for stitching a conical tent of base radius 3 m and height 4 m.*

Q9.

The length & bredth of a rectangle are in the ratio 3:2 *If the area of the rectangle is* 726 *m2*

Find its Perimeter.

Q 10 *Find the amount of concrete required to errect a concrete piller*

whose circular base perimeter is 8.8 *m and area of curve surface is* 17.6 m^2

Q 11 *Find the volume of a right circular cone with diameter* 6 *cm and slant height* 5 *cm.*

Assignment 10

(Statistics)

Q 1 *Find the range and coefficient of range of the following :*

a) 3, 6, 10, 1, 15, 16, 21, 19, 18.

b)

Age (in Years)	10-19	20-29	30-39	40-49	50-59	60-69	70-79
Frequency	3	61	223	137	53	19	4

Q 2 *Find mean deviation from mean for the following data :*

Marks	3	4	5	6	7	8
No. of Students	4	9	10	8	6	3

Q 3 *Find mean deviation from mean for the following data :*

Weight (in gms)	10-15	15-20	20-25	25-30	30-35	35-40	40-45
No. of items	7	12	16	25	19	15	6

Q 4 *Find standard deviation for the following data :*

Class interval	0-10	10-20	20-30	30-40	40-50
Frequency	14	23	27	21	15

Q 5 *Find standard deviation and coefficient of variance for the following data :*

Expenditure Below	5	10	15	20	25
No. of Students	6	16	28	38	46

Q 6 *In two factories A and B, engaged in the same area of the industry, the average weekly wages (in Rs.) and the S.D. are as below*

Factory	Average Wages	S. D.
A	34.5	5.0
B	28.5	4.5

Which factory A or B has greater variability in individual wages?