

Dr. Babasaheb Ambedkar Technological University's  
Institute of Petrochemical Engineering, Lonere –Raigad  
End Semester Examination – Dec. 2018

Sem. I (All Courses)

Subject: Basic Mathematics (DMA 1101)

Marks: 70

Date:18 Dec. 2018

Time: 3 Hours

**Note :** 1) Question No. 1 is compulsory.

2) Attempt any **FIVE** questions from Question No. 2 to Question No. 7.

3) Necessary data is given in the respective questions. If such data is not given, it means that the knowledge of that data is a part of examination.

4) If some part or parameter is noticed to be missing, you may appropriately assume and mention it clearly.

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Q.1) Solve any **Five** of the following: (10)

a) Find the value of  $\log_4 16$ .

b) Solve the determinant if  $\begin{vmatrix} 1 & 2 & 4 \\ 1 & x & x^2 \\ 1 & 1 & 1 \end{vmatrix} = \begin{vmatrix} 2 & 1 \\ 2 & 1 \end{vmatrix}$ .

c) If  $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 0 \\ 3 & -1 \end{bmatrix}$ , find  $A^T + B^T$ .

d) If  $2\cos 60^\circ \cdot \cos 10^\circ = \cos A + \cos B$ , then find the angles A and B.

e) Find the slope of a line whose inclination is  $\frac{5\pi^c}{6}$ .

f) Find the range and coefficient of range for the data : 120, 100, 130, 50, 150.

Q.2) a) If  $y = \log_2(\log_3 x)$ , find y when  $x = 3$  and x when  $y = 2$ . (4)

b) Resolve  $\frac{x^2 + 1}{(x+1)(x^2 + 4)}$  into partial fraction. (4)

c) Solve  $\begin{vmatrix} -2 & 0 & 0 \\ -6 & x & 1 \\ -4 & 0 & -1 \end{vmatrix} = -4$ . (4)

Q.3) a) If  $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$ , find  $2A + 3B - 4I$ . (4)

where I is the unit matrix of order two.

b) If  $A = \begin{bmatrix} 2 & 3 & -1 \\ 1 & 0 & 4 \end{bmatrix}$  and  $B = \begin{bmatrix} -3 & 7 \\ -5 & 6 \\ -4 & 4 \end{bmatrix}$ , then show that  $(AB)' = B'A'$ . (4)

c) Solve the following equations by adjoint method /matrix method. (4)

$$x - 2y + z = 0, \quad 2x + 3y - 2z = 2, \quad 5x - y = 3$$

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

b) Prove that  $\frac{\sin 9\theta}{\sin 3\theta} - \frac{\cos 9\theta}{\cos 3\theta} = 2$ . (4)

c) Prove that  $\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \sin^{-1}\left(\frac{77}{85}\right)$ . (4)

Q.5) a) Find the equation of a line passing through the point (2, -3) and making an angle of  $135^\circ$  with positive direction of X – axis. Also, find its X and Y – intercepts. (4)

b) If A(2,5), B(6,-1) and C(-4,-3) are the vertices of a triangle. Find the equation of median through the point A. (4)

c) Find the equation of a straight line passing through the point of intersection of lines  $2x + 3y = 13$  and  $5x - y = 7$  and perpendicular to the line  $3x - y + 7 = 0$ . (4)

Q. 6) a) Calculate mean deviation about mean of the following distribution: (6)

$x_i$	3	4	5	6	7	8
$f_i$	4	9	10	8	6	3

b) Calculate mean and standard deviation of the following frequency distribution: (6)

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

Q.7) a) The diameter of a wheel is 28 cm. It rolls through a distance of 22 meters. How many revolutions will it make? (4)

b) Using Bisection method, find the approximate root of the equation  $x^3 - x - 4 = 0$ . (Two iterations) (4)

c) Find  $\sqrt[3]{20}$  correct to three decimal places by using Newton-Raphson method. (Two iterations) (4)

ALL THE BEST

Dr. Babasaheb Ambedkar Technological University's  
Institute of Petrochemical Engineering, Lonere –Raigad  
Remedial Examination – Feb. 2019

Sem. I (All Courses)

Subject: Basic Mathematics (DMA1101)

Marks: 70

Date: Feb. 2019

Time: 3 Hours

**Note :** 1) Question No. 1 is compulsory.

2) Attempt any **FIVE** questions from Question No. 2 to Question No. 7.

3) Necessary data is given in the respective questions. If such data is not given, it means that the knowledge of that data is a part of examination.

4) If some part or parameter is noticed to be missing, you may appropriately assume and mention it clearly.

Q.1) Solve any **Five** of the following: (10)

a) Prove that  $\log(p/q) + \log(q/r) + \log(r/p) = 0$ .

b) Resolve  $\frac{x+4}{x(x+1)}$  into partial fraction.

c) If  $A = \begin{bmatrix} 2 & 4 \\ -1 & -2 \end{bmatrix}$ , show that  $A^2$  is a null matrix.

d) Find the value of  $\sin 15^\circ$  without using the calculator.

e)  $2x+3y+7=0$  and  $4x+6y+2=0$  are two straight lines. Are they parallel to each other?

f) Coefficient of variation of a certain distribution is 5 and mean is 60.  
Find the standard deviation.

Q.2) a) Solve:  $\log_2(x^2 + 7) = 4$ . (4)

b) Resolve  $\frac{x-5}{x(x+3)(x-2)}$  into partial fraction. (4)

c) Solve  $3x+3y-z=11$ ,  $2x-y+2z=9$ ,  $4x+3y+2z=25$  by using (4) Cramer's rule.

Q.3) a) If  $A = \begin{bmatrix} 1 & 2 \\ 5 & 3 \end{bmatrix}$ ,  $B = \begin{bmatrix} 2 & 6 \\ -3 & 4 \end{bmatrix}$ , find  $(AB)^T$ . (4)

b) Find the values of  $x, y, z$  if  $\begin{bmatrix} 2+x & -1 & 3 \\ 0 & y & z \\ 4 & 1 & 3 \end{bmatrix} + \begin{bmatrix} 1+x & 2 & 3 \\ 0 & 1+y & 4 \\ 2 & 3 & 5 \end{bmatrix} = \begin{bmatrix} 6 & 1 & 6 \\ 0 & -1 & 6 \\ 6 & 4 & 8 \end{bmatrix}$ . (4)

b) Find the inverse of matrix  $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$  by adjoint method. (4)

Q.4) a) Prove that  $\frac{1 - \tan 2\theta \cdot \tan \theta}{1 + \tan 2\theta \cdot \tan \theta} = \frac{\cos 3\theta}{\cos \theta}$ . (4)

b) Prove that  $\frac{\cos 2B - \cos 2A}{\sin 2A + \sin 2B} = \tan(A - B)$ . (4)

c) Prove that  $\cos^{-1}\left(\frac{4}{5}\right) - \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{63}{65}\right)$ . (4)

Q. 5) a) Find the equation of a line passing through the point  $(6, -4), (-3, 8)$ . (4)  
Also find the  $x$ -intercept and  $y$ -intercept.

b) If  $A(2, 5), B(6, -1)$  and  $C(-4, -3)$  are the vertices of a triangle. (4)  
Find the equation of altitude through the point A.

c) Find the acute angle between the lines:  $3x - y + 4 = 0$  and  $2x + y - 3 = 0$ . (4)

Q.6) a) Find mean deviation for the following data: (6)

Age in years	20-22	22-24	24-26	26-28	28-30	30-32	32-34
No. of employees	70	90	110	140	130	80	80

b) Calculate standard deviation for the following table: (6)

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

Q.7) a) The length and breadth of a rectangle are in the ratio 3:2. (4)  
If the area of the rectangle is  $726m^2$ , find its perimeter.

b) Three metal cubes with edges 6cm, 8cm, and 10 cm., respectively (4)  
are melted together and formed into a single cube. Find the diagonal of cube.

c) Find the root of the equation  $xe^x - 3 = 0$  by using Regula-Falsi method. (4)  
(Two iterations only) [Take  $e = 2.71828$ ]

**ALL THE BEST**