Sample Question Paper

Course Name : All Branches of Diploma in Engineering and Technology.

Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/

ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI

Semester   : First

Subject Title : Basic Mathematics

17104

Marks   : 100

Time: 3Hrs.

Instructions:

1. All questions are compulsory.

2. Illustrate your answers with neat sketches wherever necessary.

3. Figures to the right indicate full marks.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

Q1. Attempt any TEN of the following   **20 Marks**

a) Find x if $\begin{vmatrix} 4 & 3 & 9 \\ 3 & -2 & 7 \\ 11 & 4 & x \end{vmatrix} = 0$

b) If $A = \begin{bmatrix} 1 & 2 \\ -3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 5 \\ 1 & -3 \end{bmatrix}$, Find $3A + B$.

c) If $A = \begin{bmatrix} 3 & 9 \\ -1 & -9 \end{bmatrix}$, then show that A^2 is null matrix.

d) If $A = \begin{bmatrix} 5 & 4 \\ 4 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -3 & 4 \\ 4 & -5 \end{bmatrix}$ verify that $AB = BA$

e) Resolve into partial fraction $\dfrac{x+5}{x^2 - x}$

f) Prove that $\sin 2\theta = 2\sin\theta\cos\theta$

g) Define compound angle.

h) If $2\sin 40^0.\cos 10^0 = \sin A + \sin B$, then find A & B

i) Evaluate without using calculator: $\dfrac{\tan 66^0 + \tan 69^0}{1 - \tan 66^0.\tan 69^0}$

j) Prove that $\sin^{-1}(-x) = -\sin^{-1}(x)$

k) Find the distance between point $(-2, 3)$ and the line $3x + 2y + 26 = 0$

l) Find the range of the following distribution
   2, 3, 1, 6, 10, 17, 20, 24, 31

Q2. Attempt any FOUR of the following   **16 Marks**

a) Solve the following equations by using Cramer's rule
   $x + y + z - 6 = 0$, $2x + y - 2z + 2 = 0$, $x + y - 3z + 6 = 0$

b) Find the value of x and y ,if $\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} x & 5 & -3 \\ 2 & y & 5 \end{bmatrix} = \begin{bmatrix} 5 & -3 & 7 \\ 7 & 7 & 1 \end{bmatrix}$

c) If $A = \begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix}$, $C = \begin{bmatrix} -3 & 1 \\ 2 & 0 \end{bmatrix}$
   Verify that $A(B+C) = AB + AC$

d) $A = \begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}$ & $B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ Verify that $(AB)^T = B^T A^T$

e) Resolve in to partial fraction $\dfrac{x-5}{x^3 + x^2 - 6x}$

f) Resolve in to partial fraction $\dfrac{x^2}{(x+1)(x-2)^2}$

Q3. Attempt any FOUR of the following   **16 Marks**

a) Using matrix inversion method , solve the following equations
   $x + 3y + 3z = 12$, $x + 4y + 4z = 15$, $x + 3y + 4z = 13$

b) Resolve in to partial fraction $\dfrac{x^2 + 23x}{(x+3)(x^2 + 1)}$

c) Resolve in to partial fraction $\dfrac{\tan\theta + 1}{(\tan\theta + 2)(\tan\theta + 3)}$

d) Prove that $\sin\left(\dfrac{\pi}{2} + \theta\right) = \cos\theta$

e) Prove that $\dfrac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A$

f) Prove that $\tan^{-1} 1/2 + \tan^{-1} 1/3 = \dfrac{\Pi}{4}$

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Q4. Attempt any FOUR of the following   **16 Marks**

a) $\cos(A+B) = \cos A \cos B - \sin A \sin B$

b) Prove that $\sin 3A = 3\sin A - 4\sin^3 A$

c) Without using calculator show that $\cos 15^0 \cos 30^0 \cos 60^0 \cos 75^0 = \dfrac{\sqrt{3}}{16}$

d) prove that $\dfrac{\sin 7x + \sin x}{\cos 5x - \cos 3x} = \sin 2x - \cos 2x \cot x$

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

f) Prove that $\cos^{-1}\left(\dfrac{4}{5}\right) + \cos^{-1}\left(\dfrac{12}{13}\right) = \cos^{-1}\left(\dfrac{33}{65}\right)$.(without using calculator)

Q5. Attempt any FOUR of the following   **16 Marks**

a) Prove that $\dfrac{\cos 3A}{\cos A} + \dfrac{\sin 3A}{\sin A} = 4\cos 2A$

b) Prove that $\sin C + \sin D = 2\sin\dfrac{C+D}{2} Cos \dfrac{C-D}{2}$

c) Prove that $\tan^{-1}(x) + \tan^{-1}(y) = \tan^{-1}\left(\dfrac{x+y}{1-xy}\right)$

d) Find the perpendicular distance between two parallel lines $ax + by + c = 0$ $ax + by + c^1 = 0$

e) Find the acute angle between the lines $y = 5x + 6$ and $y = x$

f) Find the equation of the line passing through the point (3, 2) and through the intersection of the lines $2x + 3y = 1$ and $3x - 4y = 4$

Q6. Attempt any FOUR of the following   **16 Marks]**

a) If m_1 and m_2 are the slope of the two lines then prove that angle between

   two lines is $\theta = \tan^{-1}\left|\dfrac{m_1 - m_2}{1 + m_1 m_2}\right|$.

b) Find the equation of the line passing through the point of intersection of the lines
   $4x + 3y = 8$, $x + y = 1$ and parallel to the line $5x - 7y = 3$

c) In the two factories A and B ,engaged in the same industry, the average weekly wages and
   standard   deviations are as follows .

Factories	Average wages	Standard deviation
A	34.5	5.0
B	28.5	4.5

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

d) Find the range and the coefficient of range for the following data

Temperature	25-26	27-28	29-30	31-32	33-34	35-36
No of days	2	11	12	10	4	1

e) Find mean deviation from mean for the following data .

Marks obtained	10-20	20-30	30-40	40-50	50-60	60-70
No of students	4	6	10	18	9	3

f) Find variance and the coefficient of variance for the following data.

Class Interval	0-30	30-60	60-90	90-120	120-150	150-180	180-210
Frequency	9	17	43	82	81	44	24