

TH-3 ENGINEERING MATHEMATICS-I

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
 Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
- Find the value of $\frac{\sin 15 + \cos 15}{\cos 15 - \sin 15}$
 - Find the value of $\tan^{-1} \left(2 \cos \frac{\pi}{3} \right)$
 - The maximum value of $\begin{vmatrix} \sin^2 x & \sin x \cos x \\ -\cos x & \sin x \end{vmatrix}$
 - Find the value of k if the lines $2x - 3y + 7 = 0$ and $x - ky + 2 = 0$ are perpendicular to each other.
 - If $A = \begin{pmatrix} 2 & 4 \\ 3 & 13 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 5 \\ 2 & -2 \end{pmatrix}$, then find the value of $A - 2B$
 - Find centre and radius of sphere $x^2 + y^2 + z^2 - 2x - 2y - 2z - 1 = 0$
 - If the distance between the points $(-1, -1, z)$ and $(1, -1, 1)$ is 2, then find the value of z
 - Find the image of the point $(3, -1, 5)$ with respect to XY - Plane
 - Find the direction cosines of a line whose direction ratios are $(1, 1, 1)$
 - Find the Value of $\sin 70 (4\cos^2 20 - 3)$
2. Answer **Any Six** Questions 6 x 5
- Solve by Cramer's rule $2x - 3y = 7$ and $3x - 2y = 3$
 - Find the equation of circle having centre at $(2, 3)$ and circle passes through the point $(1, 2)$.
 - Prove that $\sin 20 \sin 40 \sin 60 \sin 80 = \frac{3}{16}$
 - Find angle between the planes $2x + y - 3z + 2 = 0$ and $3x - y + 2z + 3 = 0$
 - Find Inverse of the matrix $\begin{pmatrix} 2 & 1 & -2 \\ 1 & 2 & 1 \\ 3 & 6 & 4 \end{pmatrix}$
 - If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$ then prove that $x + y + z = xyz$

- g Find the equation of line passing through the point $(2, -4)$ and parallel to the line $4x + y - 3 = 0$
- 3 Prove that without expanding 10
- $$\begin{vmatrix} a - b - c & 2a & 2a \\ 2b & b - c - a & 2b \\ 2c & 2c & c - a - b \end{vmatrix} = (a + b + c)^3$$
- 4 a Find the equation of line passing through intersection of lines $2x - y - 1 = 0$ 5
and $3x - 4y + 6 = 0$ and parallel to the line $x + y - 2 = 0$
- b Find the value of $\sin^{-1} \frac{1}{\sqrt{5}} + \cos^{-1} \frac{3}{\sqrt{10}}$ 5
- 5 Find the ratio and co-ordinate in which the line segment joining the points $(1, 3, -1)$ and $(2, 6, -2)$ is divided by ZX-Plane 10
- 6 Solve by matrix method 10
 $x - y + z = 4, 2x + y - 3z = 0, x + y + z = 2$
- 7 Find the equation of plane passing through the points $(2, -3, 1)$ and $(-1, 1, -7)$ and perpendicular to the plane $x - 2y + 5z + 1 = 0$ 10