1ST SEM./COMMON TO ALL /2023(W) NEW

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

a. Evaluate $Sin\ 4365^0$

b. Find the value of $\frac{\cos\ 15^0 + \sin\ 15^0}{\cos\ 15^0 - \sin\ 15^0}$

c. Find the co-ordinates of the center of the circle $2x^2 + 2y^2 - 6x + 8y - 4 = 0$.

d. Find the distance between the points (2, 3, 4) and (3, 5, 4).

e. If $A=\begin{pmatrix}1 & 2\\ 0 & 3\end{pmatrix}$ and $B=\begin{pmatrix}4 & 1\\ 5 & 2\end{pmatrix}$ then evaluate A+ 2B.

f. Find the equation of the sphere with its center at (1, 2, 3) and radius 7 unit.

g. At x= 0^0, evaluate $\begin{vmatrix}\cos x & \sin x\\ \sin x & \cos x\end{vmatrix}$

h. Find the intercepts cut off by the line 2x+3y+1=0.

i. Find the order of the matrix B if [3 4 2] x B = [2 1 0 3 6].

j. Evaluate $Sin(\tan^{-1} x+\cot^{-1} x)$

2. Answer **Any Six** Questions 6 x 5

a. Prove that $\tan^{-1}1+\tan^{-1}2+\tan^{-1}3=\pi$

b. If $A+B=\frac{\pi}{4}$, prove that $(1+\tan A)(1+\tan B)=2$

c. Prove without expanding, $\begin{vmatrix}1 & a & a^2\\ 1 & b & b^2\\ 1 & c & c^2\end{vmatrix}=(a-b)(b-c)(c-a)$

d. Find the equation of the line which passes through the point (1,2) and perpendicular to the line 4x + 3y + 5=0.

e. Find the equation of the circle passing through the point (7,3) having radius 3 units and whose center lies on the line $y = x - 1$.

f. Find the equation of the plane which passes through the point (3, 4, -1) and parallel to the plane 2x - 3y + 5z +7 = 0.

g Find the equation of sphere if the end points of its diameter are (-1, 2, 3) and (2, 5, 6).

Answer **Any Three** Questions

3 a. Solve by matrix inverse method, 7

2x - y = 2, 3x + 2y = 17

b. If $\begin{bmatrix} x-2 & 3 \\ z-5 & 0 \end{bmatrix} = \begin{bmatrix} 2 & y+1 \\ -2 & 0 \end{bmatrix}$, Find the value of x, y, z. 3

4 a. Find the equation of the plane passing through the point (3, 2, 1) and the intersection of planes 2x + 3y - 4z + 1 = 0 and 3x - y + z + 2= 0. 5

b. Find the equation of the circle passing through the points (0, 0), (3,0) and (0, 4). 5

5 a. If $A+B+C=\pi$, prove that $\sin 2A+\sin 2B+\sin 2C=4\sin A.\sin B.\sin C$ 5

b. Prove that $\cos 20^0.\cos 40^0.\cos 60^0.\cos 80^0 = \frac{3}{16}$ 5

6 a. Verify that $(AB)^T = B^T.A^T$, where $A=\begin{pmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \end{pmatrix}, B=\begin{pmatrix} 1 & 2 \\ 2 & 0 \\ -1 & 1 \end{pmatrix}$ 5

b. Solve by Crammer's rule, 4x + 5y =3, 3x - 2y = 8. 5

7 Find the distance of the point (1, 2) from *x + 2y + 1 =0* measured parallel to the line 3x -y + 1 = 0. 10