

ENGINEERING MATHEMATICS-I**(Theory-2)**

FULL MARKS: 80

TIME: 03hrs

Figures on right hand margin indicate marks.

Group-A

1. Answer the following:

2X10

a. Express $1+\sqrt{3}i$ on polar form.b. Find the value of C_r/C_{r-1} c. Find x,y when

$$\begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$$

d. Find the number of terms in the expansion of $(x-1)^n(x+1)^n$.e. Find the General Solution of the equation $\sin x + \cos x = 1$ f. Find the value of $\cos^2 22\frac{1}{2}^\circ - \sin^2 22\frac{1}{2}^\circ$.

g. Find the equation of the line passing through (1,2) and parallel with x-axis.

h. Find the sum of the intercepts of the line $3x+4y-12=0$

i. Find the equation of the circle with centre (2,3) and touches x-axis.

j. Find Unit vector in the direction of $\vec{a} = \hat{i} + 3\hat{j} + \hat{k}$ **Group-B**

2. Answer any six of the following:

6X5

a. Obtain the square roots of $3+4i$ b. Find the term independent of x in the binomial expansion of $(x - 2/x^2)^{15}$ c. Resolve into Partial fraction $\frac{4x^2-x-1}{(x-1)(x^2+1)}$ d. If $\tan \alpha = 1/2, \tan \beta = 1/3$ then find the value of $\alpha + \beta$ e. In a triangle ABC show that $\angle C = 60^\circ$ if $\frac{1}{a+c} + \frac{1}{b+c} = \frac{3}{a+b+c}$ f. Find equation of the circle passing through origin and which cuts off intercepts a and b from co-ordinate axes.g. Find the angle between the vectors $\vec{a} = \hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - \hat{k} + 4\hat{j}$

h. Find the ratio of the line joining the points A(4,4) and B(7,7) divided by P(-1,1)

Group-C

Answer any three:

10x3

3. a. If $x + 1/x = 2\cos\theta$ and $y + 1/y = 2\cos\beta$ then find the value of $xy + \frac{1}{xy}$ b. Find the distance between the lines $x+3y-7=0$ and $2+6y-4=0$

4. a. Prove that $2\tan^{-1} 1/5 - \tan^{-1} 1/4 = \tan^{-1} 8/53$

b. Find the distance of the points (2,3) from the straight line $x-y+4=0$ measured parallel to $x+2y-1=0$

5. a. Prove that
$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

b. If $A+B+C=\pi$ then show that $\sin 2A + \sin 2B - \sin 2C = 4 \cos A \cos B \sin C$

6. a. Solve by Matrix Conversion Method

$$x+y+z=3$$

$$2x+3y+4z=9$$

$$x+2y-4z=-1$$

b. Find the area of the parallelogram whose adjacent sides are $\vec{a} = \hat{i} + \hat{j} + \hat{k}$

$$\text{and } \vec{b} = 2\hat{i} + \hat{j} - 3\hat{k}$$

7. a. Show that the points (9,1), (7,9), (-2,12) and (6,10) are concyclic.

b. Prove sine formula by Vector Method.
