**a. The two alternating voltages are given by** $v\_{1}=15 sinωt volts and v\_{2}=25\sin(\left(ωt-\frac{π}{6}\right))volts. $

i. Determine a sinusoidal expression for the resultant $v\_{R}=v\_{1}+v\_{2}$ by finding the horizontal and vertical components.

ii. Determine the resultant $v\_{R}$=$v\_{1}-v\_{2}$ using horizontal and vertical components.

 **(b)Calculate the 1st and 2nd moment of area for the shape shown about the axis s-s and find the position of the centroid. ( Part of L.O. 3.1)**



L.O. (Part of 3.1)

(c) Find the eigenvalues and eigen vectors for the matrix

$$\left(\begin{matrix}0&2&1\\4&1&0\\4&0&1\end{matrix}\right)$$

**TASK: 5**

**Determine the power series solution of the differential equation:**

$\frac{d^{2}y}{dx^{2}}+x\frac{dy}{dx}+2y=0$ **Using Leibniz - Maclaurin’s method, given the boundary conditions that at**

$x=0, y=1 and \frac{dy}{dx}=2$ **(L.O.4: 4.4)**

TASK 6:

1. Determine the general power series solution of Bessel’s equation.

$$x^{2}\frac{d^{2}y}{dx^{2}}+x\frac{dy}{dx}+\left(x^{2}-v^{2}\right)y=0$$

 (Part of D3)

1. Show that the power series solution of the Bessel equation of the above problem may be written in terms of the Bessel functions $J\_{v}\left(x\right) and J\_{-v}\left(x\right) as:$

$$AJ\_{v}\left(x\right)+BJ\_{-v}\left(x\right)=\left(\frac{x}{y}\right)^{v}\left\{\frac{1}{τ(v+1)}-\frac{x^{2}}{2^{2}\left(1!\right)τ(v+2)}+\frac{x^{4}}{2^{4}\left(2!\right)τ(v+4)}- ….\right\}$$

 $ (part of D3)$