QUESTION: Roll – CSE15B001, CSE15B016 and CED15I039..

Find all the cache misses that have occurred for each
iteration on multiplying 2 matrices A and B, for all the combinations of the iterations I,J,K.

Hint :- Compiler based optimizations for reducing cache misses.

The IJK loop:

```
for(i=0;i<n;i++)
        for (j=0;j<n;j++)
                for(k=0;k<n;k++)
                        C[i][j]=c[i][j]+(a[i][k]*b[j][k]);
```

For IJK LOOP: The array A and C are accessed in row major order and B is accessed in column major order.

FOR JKI LOOP: A and B are accessed in row major order and C is accessed in column major order . Therefore there are cache misses here .

For KJI LOOP: B is accessed in row major order and A and C are accessed in column major order .Therefore there are two cache misses.

For JIK LOOP: A is accessed in row major order and B and C are accessed in column major order .Therefore there are two cache misses.

For KIJ loop: here B and C are accessed in row major access. And A is accessed in column major order.therefore there will be a cache miss in each iteration

For IKJ LOOP: A, B ,C are all accessed in row major order . Therefore there will be significant reduction in the number of the cache misses .
CACHE misses:
Based on the size of the cache memory and the number of columns and rows of the given matrix the cache misses will occur .
i.e if the size of cache is 4 and if A and B are 8x8 matrix there will be 2 cache misses for the element access in A and 8 misses for accessing B .
This will occur for every iteration
Compiler level optimization:
Blocking technique:
Storing row elements and the column elements as the particular blocks at a time for reducing the no. of misses.