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CSE A 15
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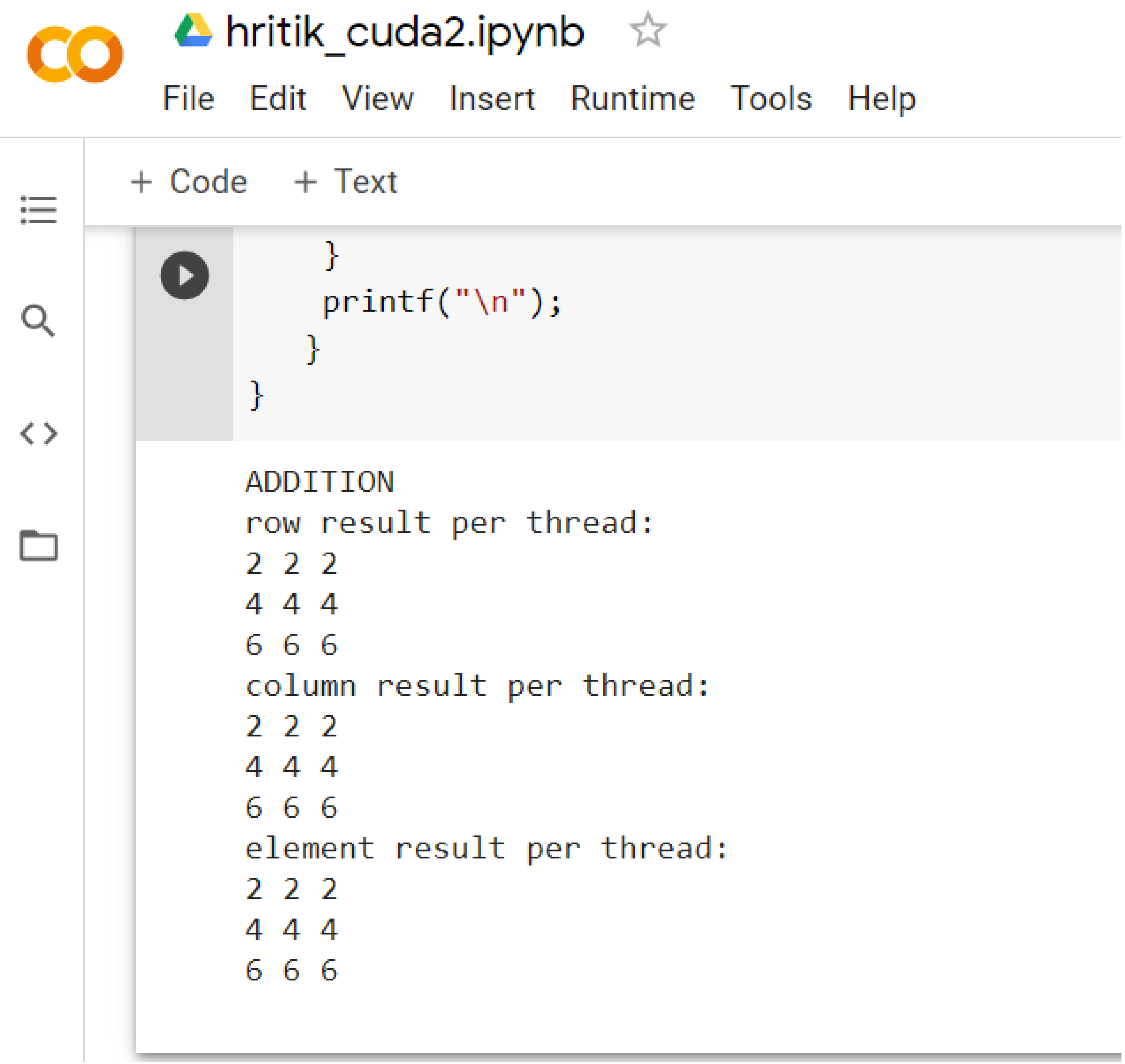
PCAP WEEK 6

Q1) %%cu

```
#include<stdio.h>
#include<cuda.h>
#include<stdlib.h>

__global__ void AddRowPerThread(int *a,int *b,int *c,int m,int n)
{
  int id=threadIdx.x;
  if(id<m)
  {
  for(int i=0;i<n;i++)
  {
    c[id*n+i]=a[id*n+i]+b[id*n+i];
  }
  }
}

__global__ void AddColPerThread(int *a,int *b,int *c,int m,int n)
{
  int id=threadIdx.x;
  if(id<n)
  {
    for(int i=0;i<m;i++)
    {
      c[id+i*n]=a[id+i*n]+b[id+i*n];
    }
  }

}

__global__ void AddElePerThread(int *a,int *b,int *c,int m,int n)
{
  int id=threadIdx.x;
  if(id<m*n)
  {
      c[id]=a[id]+b[id];
  }

}

int main()
{
  int m=3,n=3;
  //declare matrices
  int a[3][3]={{1,1,1},{2,2,2},{3,3,3}};
  int b[3][3]={{1,1,1},{2,2,2},{3,3,3}};
  int c[m][n];
  int *d_a,*d_b,*d_c;
  //allocate memory
  int size=m*n*sizeof(int);
  cudaMalloc((void**)&d_a,size);
  cudaMalloc((void**)&d_b,size);
  cudaMalloc((void**)&d_c,size);
  //copy from host to device
  cudaMemcpy(d_a,a,size,cudaMemcpyHostToDevice);
  cudaMemcpy(d_b,b,size,cudaMemcpyHostToDevice);

   // Launch add() kernels on GPU
   //Number of blocks=1 threads=m
  printf("ADDITION\n");
   printf("row result per thread:\n");
   AddRowPerThread<<<1,m>>>(d_a, d_b, d_c,m,n);
   cudaMemcpy(c, d_c,size,cudaMemcpyDeviceToHost);
   for(int i=0;i<m;i++)
   {
    for(int j=0;j<n;j++)
    {
      printf("%d ",c[i][j]);
    }
    printf("\n");
   }
   //Number of blocks=1 threads=n
   printf("column result per thread:\n");
   AddColPerThread<<<1,n>>>(d_a, d_b, d_c,m,n);
   cudaMemcpy(c, d_c,size,cudaMemcpyDeviceToHost);
   for(int i=0;i<m;i++)
   {
    for(int j=0;j<n;j++)
    {
      printf("%d ",c[i][j]);
    }
    printf("\n");
   }
   //Number of blocks=1 threads=m*n
   printf("element result per thread:\n");
   AddElePerThread<<<1,m*n>>>(d_a, d_b, d_c,m,n);
   cudaMemcpy(c, d_c,size,cudaMemcpyDeviceToHost);
   for(int i=0;i<m;i++)
   {
    for(int j=0;j<n;j++)
    {
      printf("%d ",c[i][j]);
    }
    printf("\n");
   }
}
```

OUTPUT:



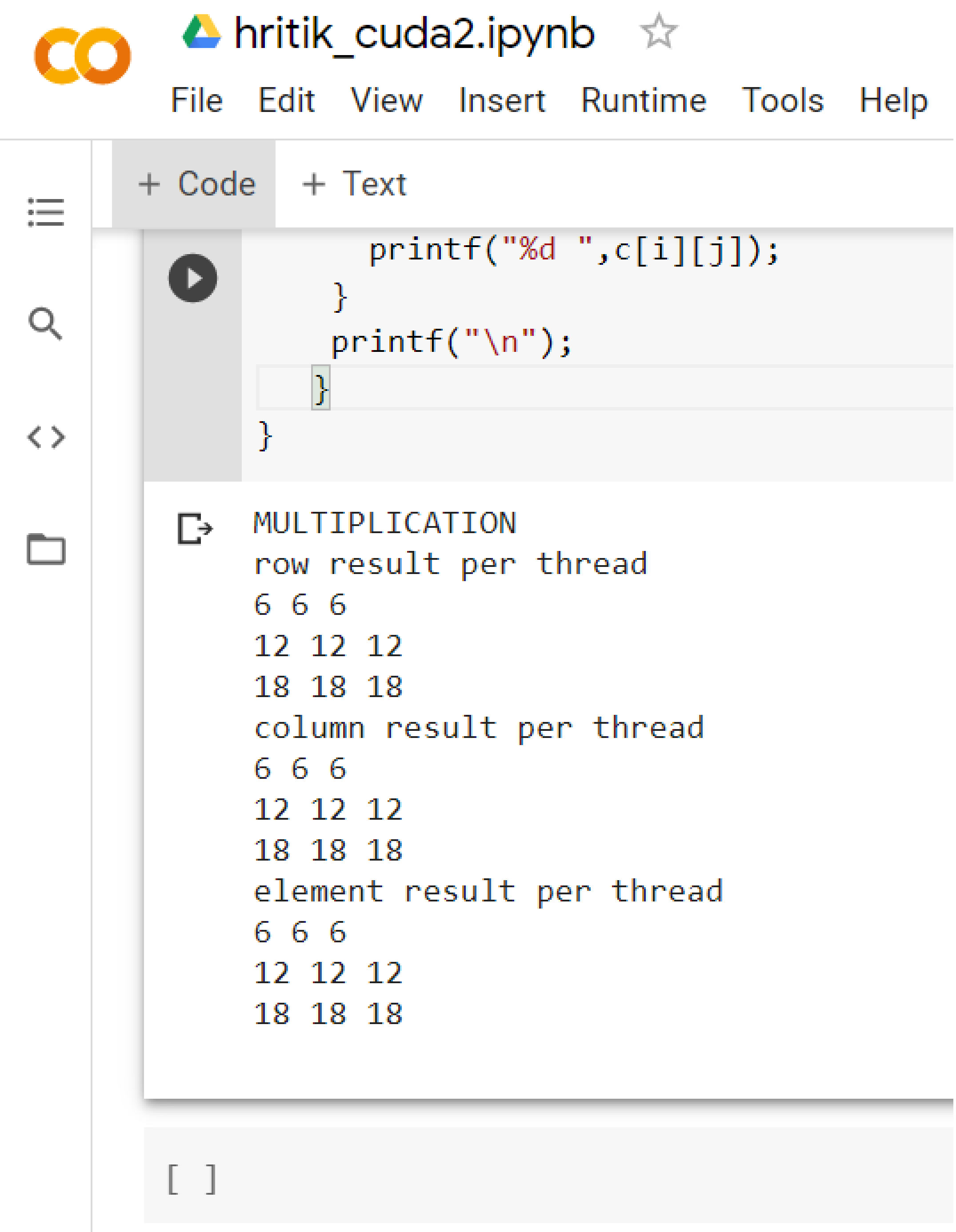
```
        }
        printf("\n");
      }
}
```

```
ADDITION
row result per thread:
2 2 2
4 4 4
6 6 6
column result per thread:
2 2 2
4 4 4
6 6 6
element result per thread:
2 2 2
4 4 4
6 6 6
```

Q2)

```
%%cu
#include<stdio.h>
#include<cuda.h>
#include<stdlib.h>
#include<iostream>
__global__ void MulRowPerThread(int *a,int *b,int *c,int m,int n,int o)
{
  int id=threadIdx.x;
  if(id<m)
  {
  for(int i=0;i<o;i++)
  {
    c[i+id*o]=0;
    for(int k=0;k<n;k++)
    c[i+id*o]+=a[id*n+k]*b[i+k*o];
  }
  }
}

__global__ void MulColPerThread(int *a,int *b,int *c,int m,int n,int o)
{
  int id=threadIdx.x;
  if(id<o)
  {
    for(int i=0;i<m;i++)
    {
      c[id+i*o]=0;
      for(int k=0;k<n;k++)
      c[id+i*o]+=a[i*n+k]*b[id+k*o];
    }
  }

}

__global__ void MulElePerThread(int *a,int *b,int *c,int m,int n,int o)
{
  int id=threadIdx.x;
  if(id<m*o)
  {
    c[id]=0;
    for(int k=0;k<n;k++)
    c[id]+=a[(id/o)*n+k]*b[(id%o)+k*o];
  }

}

int main()
{
  int m=3,n=3,o=3;
  //declare matrices
  int a[3][3]={{1,1,1},{2,2,2},{3,3,3}};
  int b[3][3]={{1,1,1},{2,2,2},{3,3,3}};
  int c[m][o];
  int *d_a,*d_b,*d_c;
  //allocate memory
  int size=sizeof(int);
  cudaMalloc((void**)&d_a,m*n*size);
  cudaMalloc((void**)&d_b,n*o*size);
  cudaMalloc((void**)&d_c,m*o*size);
  //copy from host to device
  cudaMemcpy(d_a,a,m*n*size,cudaMemcpyHostToDevice);
  cudaMemcpy(d_b,b,n*o*size,cudaMemcpyHostToDevice);

   // Launch add() kernels on GPU
   //Number of blocks=1 threads=m
 printf("MULTIPLICATION\n");
   printf("row result per thread\n");
   MulRowPerThread<<<1,m>>>(d_a, d_b, d_c,m,n,o);
   cudaMemcpy(c, d_c,m*o*size,cudaMemcpyDeviceToHost);
   for(int i=0;i<m;i++)
   {
    for(int j=0;j<o;j++)
    {
      printf("%d ",c[i][j]);
    }
    printf("\n");
   }
   //Number of blocks=1 threads=n
   printf("column result per thread\n");
   MulColPerThread<<<1,o>>>(d_a, d_b, d_c,m,n,o);
   cudaMemcpy(c, d_c,m*o*size,cudaMemcpyDeviceToHost);
   for(int i=0;i<m;i++)
   {
    for(int j=0;j<o;j++)
    {
      printf("%d ",c[i][j]);
    }
    printf("\n");
   }
   //Number of blocks=1 threads=m*n
   printf("element result per thread\n");
   MulElePerThread<<<1,m*n>>>(d_a, d_b, d_c,m,n,o);
   cudaMemcpy(c, d_c,m*o*size,cudaMemcpyDeviceToHost);
   for(int i=0;i<m;i++)
   {
    for(int j=0;j<o;j++)
    {
      printf("%d ",c[i][j]);
    }
    printf("\n");
   }
}
```

OUTPUT:



```
      printf("%d ",c[i][j]);
    }
    printf("\n");
   }
}
```

```
MULTIPLICATION
row result per thread
6 6 6
12 12 12
18 18 18
column result per thread
6 6 6
12 12 12
18 18 18
element result per thread
6 6 6
12 12 12
18 18 18
```