Per this assignment, my code is highlighted and injected into the lab's rubric's supplied timer codes.

```
// Student Name: Nathan Phipps
// ELEC 3651 : ISA Coding Homework
#include <iostream>
#include <string>
using namespace std;
#ifndef NDEBUG
#   define CheckResult(Result, Expected, Msg) \
    __CheckResult(Result, Expected, __FILE__, __LINE__, Msg)
#endif
void __CheckResult(unsigned int Result, unsigned int Expected, const char* file, int line, const char* msg)
{
    bool expr = (Result == Expected);
    if (!expr)
    {
        cout << "Check failed:\t" << msg << "\n"
             << "Result :\t" << hex << Result << "\n"
             << "Expected:\t" << hex << Expected << "\n"
             << "Source:\t\t" << file << ", line " << line << "\n";
        //abort();
    }
    else {
        cout << "Check Passed" << "\n";
    }
}
unsigned int function_PACK(unsigned int inputA, unsigned int inputB)
{
   // Write code
    unsigned int output = 0;
    unsigned int A0 = inputA & 0X000000FF;
    unsigned int A1 = (inputA >> 8) & 0X000000FF;
    unsigned int A2 = (inputA >> 16) & 0X000000FF;
    unsigned int A3 = (inputA >> 24) & 0X000000FF;
    unsigned int B0 = inputB & 0X000000FF;
    unsigned int B1 = (inputB >> 8) & 0X000000FF;
    unsigned int B2 = (inputB >> 16) & 0X000000FF;
    unsigned int B3 = (inputB >> 24) & 0X000000FF;

    output = (B2 << 24) | (B0 << 16) | (A2 << 8) | (A0);

   return output;
}

unsigned int function_MIX(unsigned int inputA, unsigned int inputB)
{
   // Write code
    unsigned int output = 0;
```

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    unsigned int A0 = inputA & 0X000000FF;
    unsigned int A1 = (inputA >> 8) & 0X000000FF;
    unsigned int A2 = (inputA >> 16) & 0X000000FF;
    unsigned int A3 = (inputA >> 24) & 0X000000FF;
    unsigned int B0 = inputB & 0X000000FF;
    unsigned int B1 = (inputB >> 8) & 0X000000FF;
    unsigned int B2 = (inputB >> 16) & 0X000000FF;
    unsigned int B3 = (inputB >> 24) & 0X000000FF;
    output = (B2 << 24) | (A2 << 16) | (B0 << 8) | (A0);

    return output;
}

unsigned int function_REPLICATE(unsigned int inputA, unsigned int inputB)
{
   // Write code
    unsigned int output = 0;
    unsigned int B; /* B is a selected integer 0 - 4, which affects overall output, which is based on A*/
    unsigned int A = (inputA >> (8*inputB)) & 0x000000FF;
    output = (A) | (A << 8) | (A << 16) | (A << 24);

   return output;
}

unsigned int function_PERMUTE(unsigned int inputA, unsigned int inputB)
{
   // Write code
   unsigned int output = 0;

    unsigned int B0 = inputB & 0X000000FF;
    unsigned int B1 = (inputB >> 8) & 0X000000FF;
    unsigned int B2 = (inputB >> 16) & 0X000000FF;
    unsigned int B3 = (inputB >> 24) & 0X000000FF;

    unsigned int A0 = (inputA >> (8*B0)) & 0X000000FF;
    unsigned int A1 = (inputA >>  (8*B1)) & 0X000000FF;
    unsigned int A2 = (inputA >>  (8*B2)) & 0X000000FF;
    unsigned int A3 = (inputA >>  (8*B3)) & 0X000000FF;

    output = (A3 << 24) | (A2 << 16) | (A1 << 8) | (A0);

   return output;
}

unsigned int function_EXTRACT_BITS(unsigned int inputA, unsigned int inputB)
{
   // Write code
   unsigned int output = 0;
```

```
  output = ((inputB & 0x10000000) >> 17) | ((inputB & 0x10000) >> 10) |
   ((inputB & 0x100) >> 3) | ((inputB & 0x1) << 4) | ((inputA & 0x1000000) >> 21) | ((inputA & 0x10000) >> 14) |
     ((inputA & 0x100) >> 7) | (inputA & 0x1);

  return output;
}

int main()
{
  cout << "Testing PACK: ";
  CheckResult( function_PACK(0x11223344,0xAABBCCDD), 0xBBDD2244, "PACK TEST");
  cout << "\n";
  cout << "Testing MIX: ";
  CheckResult( function_MIX(0x11223344,0xAABBCCDD), 0xBB22DD44, "MIX TEST");
  cout << "\n";
  cout << "Testing REPLICATE: ";
  CheckResult( function_REPLICATE(0x11223344,1),  0x33333333, "REPLICATE TEST");
  cout << "\n";
  cout << "Testing PERMUTE: ";
  CheckResult( function_PERMUTE(0xAABBCCDD,0x02020003), 0xBBBBDDAA,  "PERMUTE TEST");
  cout << "\n";
  cout << "Testing EXTRACT_BITS: ";
  CheckResult( function_EXTRACT_BITS(0xFF00FF00,0x00010203), 0x5A, "EXTRACT_BITS TEST");
  cout << "\n";
  return 0;
}
```