UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2010/2011

COURSE NAME	:	EMBEDDED SYSTEM APPICATIONS
COURSE CODE	:	DEC 3213
PROGRAMME	:	3 DEE/DET
EXAMINATION DATE	:	APRIL/MAY 2011
DURATION	:	2 1/2 HOURS
INSTRUCTIONS	:	ANSWER **ALL** QUESTIONS IN SECTION A AND ANY TWO QUESTIONS IN SECTION B.

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

SECTION A

Q1. Give a brief description of embedded systems.

Q2. List four (4) examples of embedded system applications.

Q3. Define the term PLD (Programmable Logic Device)

Q4. How does the architecture of FPLAs differ from PROMs and PALs ?

Q5. Name the seven steps involved in the design, programming and testing of a PLD.

Q6. What capability does a polarity fuse give a PLD designer ?

Q7. What is the main advantage of an EPLD.

Q8. Name the three modes of operation for a GAL 16V8A.

Q9. In which mode is pin1 of the GAL 16V8A dedicated as a clock input.

Q10. Name the two software packages that are used to implement PLD circuits.

Q11. What is a JEDEC file?

Q12. Describe the difference between a low-level development software and high level compilers.

Q13. Name four ways of entering a digital design into a computer.

Q14. Describe what QA.D represents.

Q15. How are compiling errors corrected ?

(60 marks)

SECTION B

Q1 For the complete PLD design file as shown on Figure Q1

a) Draw the complete state diagram

(10 marks)

b) Draw the waveform diagram. It should include the following pins CLK, QD, QC, QB, QA, GT9.

(10 marks)

Q2 Write the complete CUPL input file for a Prime number detector circuit that will detect a 4-bit input number as a prime number. The prime numbers possible with 4-bits are: 1, 2, 3, 5, 7, 11, 13.

(20 marks)

Q3 Part of the PLD design file for a stepper motor controller is as in Figure Q3.
This is a half-step sequencer to control a stepper motor using a GAL16V8. The sequencer should produce the appropriate sequence of states to drive the motor either clockwise (CW) or counterclockwise (CCW). The stepper direction is controlled by the signal CW. The stepper enable is called STEP. The function table is as given in Table Q3. The sequencer is self-starting

a) Draw the state diagram for the half-step sequence of the stepper motor control
(10 marks)

b) Write the complete sequence statement for the stepper motor controller

(10 marks)

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```
Name     Embeded Systems Applications ;
PartNo   002 ;
Date     3/22/11 ;
Revision 01 ;
Designer Engineer B.Eng. ;
Company  UTHM ;
Assembly None ;
Location Parit Raja ;
Device   G16V8A ;
/* *************** INPUT PINS *********************/
PIN  1 = CLK              ; /*  CLOCK INPUT            */
PIN  2 = !E               ; /*  COUNT ENABLE           */
PIN 11 = !OE              ; /*  OUTPUT ENABLE          */

/* *************** OUTPUT PINS *********************/
PIN [14..17] = [QA,QB,QC,QD]  ; /*  COUNTER OUTPUTS          */
PIN  12  =  GT9           ; /*                          */

field COUNTER = [QD,QC,QB,QA];

$define S0   'b'0000
$define S1   'b'0001
$define S2   'b'0010
$define S3   'b'0011
$define S4   'b'0100
$define S5   'b'0101
$define S6   'b'0110
$define S7   'b'0111
$define S8   'b'1000
$define S9   'b'1001
$define S10  'b'1010
$define S11  'b'1011
$define S12  'b'1100
$define S13  'b'1101
$define S14  'b'1110
$define S15  'b'1111

sequence COUNTER   {
          present S0          if E      next  S10;
                              default   next  S0;
          present S10         if E      next  S5;
                              default   next  S10;
          present S5          if E      next  S15;
                              default   next      S5;
          present S15         if E      next  S3;
                              default   next      S15;
          present S3          if E      next  S12;
                              default   next      S3;
          present S12         if E      next  S6;
                              default   next      S12;
          present S6          if E      next  S9;
                              default   next      S6;
          present S9          if E      next  S8;
                              default   next     S9;
          present S8          if E      next  S1;
                              default   next      S8;
          present S1          if E      next  S0;
                              default   next      S1;
                              }
  GT9 = COUNTER:[10,15,12];
```

FIGURE Q1