Roll No: ----------

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: M. Tech A&RE **Semester – I**
Subject (Course): Embedded Systems **Max. Marks : 100**
Course Code : ECEG7003 **Duration : 3 Hrs**
No. of page/s: 02

SET-1
SECTION – A
Answer All. Each Question carries 5 marks

1. In the architecture of ARM, explain the work of barrel shifter in detail.
2. The internal processor of LCD takes time to latch and make the necessary adjustments as per the command word. Name and explain the flag that indicates busy status of LCD.
3. In AVR microcontroller TCCR0 register format is given below

Bit	7	6	5	4	3	2	1	0	
	FOC0	WGM00	COM01	COM00	WGM01	CS02	CS01	CS00	TCCR0
Read/Write	W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	
Initial Value	0	0	0	0	0	0	0	0	

Explain the role of highlighted bits.

4. Consider the following embedded systems
   i) Canon EOS 3 DSLR
   ii) System to give alert if seat belt has been put up by driver or not
   iii) A robot playing soccer in robo-cup
   Explain clearly whether to use a controller or processor in designing the systems. Also comment on the size of controller or processor used.

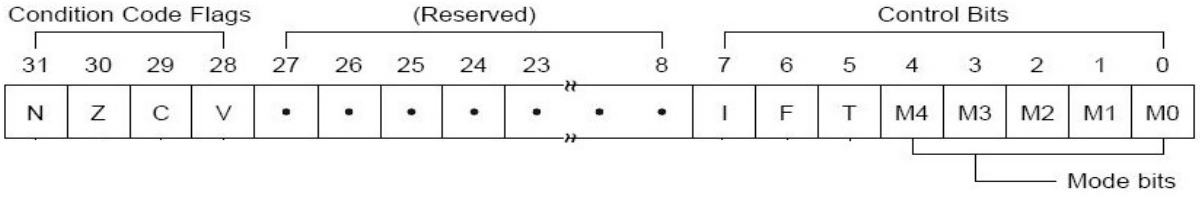
SECTION – B
Answer Any Four. Each Question carries 10 marks

5. Design the memory organization of AT Mega32 AVR series of microcontroller. Consider Flash memory, SRAM and EEPROM into consideration.
6. Explain the terms with circuit diagram:
   i) Pull up and Pull down register of At MEGA 16
   ii) ADC port of AVR Microcontroller
   iii) Reset circuitry
   iv) External & Internal Interrupt
7. In AVR while interfacing LCD explain what should be the values of DB0-DB7 bits and values of RS and R/w bits in order

i) Write data to CG or DD RAM
ii) Read data from CG or DD RAM
iii) Shifting the cursor and Display
iv) Display ON/OFF control

8. In AVR write a C code to control the brightness of LED using timers in PWM mode. Also comment on the format of registers used.

9. What are the different operating modes of ARM7? Give the different combination of bits M [4:0] of the status register given below to select the operating modes.



SECTION-C

Answer any two. Each question carries 20marks

10. Design an algorithm and write its code to transmit 16-bit ADC value to receiver using UART protocol in AVR. Take potentiometer to transmit values (0-1023).

11. Design the A to D converter using AVR with the following specifications
i) A_{ref} = Vcc
ii) Divison factor of prescalar = 128

Write the complete code to convert the analog value to its digital equivalent and display the same on LCD. Also draw the schematic

12. The common ARM nomenclature is given below

Write the specific meaning of each alphabet of the nomenclature. Also write the different versions of ARM family

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SET-2
SECTION – A

Answer All. Each Question carries 5 marks

1. Explain in detail the thumb instruction set of ARM7
2. What is the use of scheduling algorithms in the design of RTOS
3. Consider the following code

```
float x = 3.141592653589793238;
double z = 3.141592653589793238;
printf("x1=%f\n", x);
printf("z1=%f\n", z);
printf("x2=%20.18f\n", x);
printf("z2=%20.18f\n", z);
```

   Write the outputs of x1, x2, z1 and z2. Explain why outputs are different in each case.
4. Differentiate between binary semaphore and counting semaphore.

SECTION – B

Answer Any Four. Each Question carries 10 marks

5. Write a C code for LPC2148 to interface a seven segment display connected at PORT0. Also draw its schematic
6. Explain the terms with circuit diagram:
   i) Role of External Crystal in microcontroller
   ii) ADC port of AVR Microcontroller
   iii) Reset circuitry
   iv) External & Internal Interrupt of ARM
7. Write a C code for AVR to interface DC motor which is connected at PC0-PC3 using L293D. Also draw the circuit

8. Differentiate TIMER0, TIMER1 and TIMER2 of AVR microcontroller
9. What are the different ARM processors available? Classify them according to their application.

SECTION-C

Answer any two. Each question carries 20marks

10. In the design of serial communication of AVR write the algorithm steps to initialize USART and transmit and receive characters using serial port. Also write the code
11. Using timers of LPC2148, design an interfacing circuit to control the brightness of light emitting diode connected at PORT1. The design should include the C code and schematic.
12. Design a system to configure LED connected at GPIO pins of ARM7. Blink the LEDS with a delay of 1second. Highlight all the registers used in this design.