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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: M.Tech ASE (UAV) — **Semester – I**
Subject (Course): Microcontroller and Embedded Systems — **Max. Marks : 100**
Course Code : AVEG 7002 — **Duration : 3 Hrs**
No. of page/s: 02

Section A
All the questions in this section are compulsory

(5x4=20 Marks)

1. Write a program to monitor PB7 bit. When it is low, send $55 and $AA to PORTC Continuously.
2. For 3 and 2 the keyboard gives 33H and 32H, respectively. Write a Program to convert these values to packed BCD and store the result in R20.
3. Give two advantages of macros.
4. Find the checksum byte for the following ASCII message: "HELLO".
5. What is the difference between EEPROM and data RAM space in AVR?

Section B
(All the questions in this section are compulsory)

(4X10=40 Marks)

6. Write an AVR C program to transmit serially the message "The earth is but one country and mankind its citizens" continuously at 57,600 baud rate.
7. Find step size for AVR ADC, if Vref = 2.56V, Calculate the first D0-D9 output if the analog input is: a) 0.7V and b) 1V.
8. For ATMEGA 32 with 16 MHZ crystal, calculate the delay for the following program

```
BACK:   LDI R16, 0x55
        OUT PORTB, R16
        CALL DELAY
        LDI R16, 0xAA
        OUT PORTB, R16
        CALL DELAY
        RJMP BACK

DELAY:  LDI, R20, 0xFF
AGAIN:  NOP
        NOP
        DEC R20
        BRNE AGAIN
        RET
```

9. (A)Discuss the pin diagram of ATMEGA 32 microcontroller.

or

(B)Discuss about the steps to create an executable Assembly Language Program.

Section C

(All the questions in this section are compulsory)

(2X20= 40 Marks)

10. Quadcopters require extensive hours of practice to be able to properly control due to their use of four separate motors to achieve flight. Obstacle avoidance ease the use of quadcopters by means of formulating a programming protocol and an array of sensors for a quadcopter to avoid collisions. Develop an embedded C code to detect the obstacle using an ultrasonic sensor (working on ADC, ref voltage 5V) and display the distance to obstacle on a 16X2 LCD. Support your code with a neat sketch which should include all the interfacing diagrams.

11. For AVR Timers, Answer the following:
    a. Generate a wave with duty cycle of 75% in non-inverted mode, calculate OCR0
    b. Find the value for TCCR0 for phase correct PWM, non-inverted PWM wave generator, and no prescaler.
    c. Assume that XTAL=8 MHz, find the TCNT0 value needed to generate a time delay of 20s. Use normal mode, no prescaler mode.

OR

Discuss in detail about the following

a. Architecture of Micro Controller
b. Explain the Assembly and Running of AVR program
c. Write a program to toggle all the bits of Port A of ATMEGA32 microcontroller with a delay of 5ms. Consider the crystal attached is having a frequency of 22MHz.
d. Find the machine cycle for crystal frequency 20MHz, 10MHz and 16MHz
e. Create a flowchart and write a program to get the statuses of PD6 and PD7 and put them on PC0 and PC7 respectively.

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

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: M.Tech ASE (UAV)	**Semester – I**
Subject (Course): Microcontroller and Embedded Systems	**Max. Marks : 100**
Course Code : AVEG 7002	**Duration : 3 Hrs**
No. of page/s: 03	

Section A
(All the questions in this section are compulsory)

(5x4=20 Marks)

1. Write a program to monitor bit PC3. When it is high, send 0X55 to PORTD
2. Write a program to convert the following packed BCD numbers to ASCII. Place the ASCII codes into R20 and R21.
    a. 0X76
    b. 0X87
3. Give the two factors that can affect time delay in AVR microcontroller. Of the two factors which can be set by the system designer?
4. Write a program to get an 8-bit binary number from PORTD, convert it to ASCII, and save the result in RAM locations $40, $41 and $42. What is the result if PORTD has 1000 1101 binary as input?
5. In a given byte addressable computer, memory locations 10000H to 9FFFFH are available for user programs. Calculate the following
    a. The total number of bytes available
    b. The total number of kilobytes

Section B
(All the questions in this section are compulsory)

(4X10 = 40 Marks)

6. Write an AVR C Program to transmit serially the letter ‘Z’ continuously at 9600 baud rate.
7. (A) Give the two factors that can affect time delay in AVR microcontroller. Of the two factors which can be set by the system designer?

    Or

    (B) List out the differences between IN instruction and LDS instruction.

8. Find step size for AVR ADC, if V_{ref} = 5V, Calculate the first D0-D9 output if the analog input is: a) 0.99V and b) 2V.

9. Find the time delay for delay subroutine shown below if the system has an AVR with a frequency of 8 MHz

```
        LDI R16,200
BACK: LDI R18,100
HERE: NOP
        DEC R18
        BRNE HERE
        DEC R16
        BRNE BACK
```

Section C

(All the questions in this section are compulsory)

(2X20 = 40 Marks)

10. For controlling pick and place robot, the following controlling sequence is given below in drum control

MOVE TO pick_part
CLOSE gripper
MOVE TO place_part
OPEN gripper

	Servo 1 (base)	Servo 2 (Joint 1)	Servo 3 (Joint 2)	Gripper
pick_part	45	20	30	-
Close Gripper	-	-	-	0
place_part	90	20	30	-
Open gripper	-	-	-	180

Develop an AVR C program to perform the following given algorithm

11. For AVR Timers, Answer the following
    a. Assume that XTAL=8 MHz, find the TCNT0 value needed to generate a time delay of 5ms. Use normal mode, and largest prescaler possible.
    b. Find the TCCR0 value to initialize Timer0 for fast PWM mode, Non-Inverted PWM wave generator and no prescaler.
    c. Assuming XTAL = 8 MHz, using non-inverted mode, write a program that generates a wave with frequency of 31,250 Hz and duty cycle of 75%.

OR

For the status register, Answer the following:
    a. Which bits of status register are used for C and H flag bits
    b. Which bits of status register are used for V and N flag bits

c. In ADD instruction when is C raised
d. In ADD instruction when is H raised
e. What is the status of C and Z flags for the following code?
   LDI R20,0XFF
   LDI R21,1
   ADD R20,R21
f. What are the fags that are raised when arithmetic and logical operations are performed in Status Register. Indicate all the bits used in a status register