his question paper contains 4+1 printed pages]

Roll No. | | | | | | | | | | |

. No. of Question Paper : 2790

nique Paper Code : 32517916 1615/19 IC

ame of the Paper : Embedded Systems

ame of the Course : B.Sc. (H) Electronics : DSE-4

emester : VI

uration : 3 Hours Maximum Marks : 75

rite your Roll No. on the top immediately on receipt of this question paper.)

Question No. **1** is compulsory.

Attempt any *four* questions out of the remaining six.

All questions carry equal marks.

Write answers of all parts of a question at one place only.

(*a*) Give three major criteria for choosing a microcontroller for an embedded system application.

(*b*) What is function of SREG ? Briefly explain the function of I, N, C bit of SREG.

(*c*) Differentiate between the following instructions :

(*i*) MULS and MULSU

(*ii*) COM and NEG.

P.T.Q.

(*d*) What is the additional role of general purpose registers R26-R31 in AVR microcontrollers ?

(*e*) What should be the value of TCCR0 to program Timer 0 in Normal mode with no prescaling. AVR's crystal oscillator is used for the clock source. 5×3=15

2. (*a*) Explain the different categories of embedded system.

(*b*) Briefly explain the function of the following registers :

(*i*) DDRx

(*ii*) PORTx

(*iii*) PINx

where, *x* could represent any of the I/O ports (such as port B, port C, port D). Also explain the purpose of pull-up resistors.

(*c*) A temperature sensor is connected to PB7 to PB0 pins of Port B. Write an AVR C/assembly program to continuously monitor the status at Port B pins. Perform the following depending on the value of the temperature

(T) detected at Port B :

If T < 75, send 0 × 00 at PORTA

If T = 75, send 0 × 01 at PORTA

If T > 75, send 0 × 02 at PORTA 5+5+5

3. (*a*) Assume that R20 has the number –6. Show that LSR instruction cannot be used to divide the contents of R20 by 2. Instead of 'LSR' which instruction can be used for division of signed numbers by 2 ?

(*b*) Explain the function of the following instructions with an example :

(*i*) BREQ

(*ii*) EOR

(*iii*) LPM

(*iv*) SBIS

(*v*) IN.

(*c*) Write an AVR C/assembly program to continuously toggle bit 2 and bit 4 of Port B, without disturbing the other bits. 5+5+5

P.T.O.

4. (*a*) Briefly explain the various Data Addressing Modes of AVR microcontroller.

(*b*) What do you understand by "Watchdog Reset" ? How do we select Watchdog Reset time-period ?

(*c*) Differentiate between the different types of microcontroller architecture :

Which one is considered the best for embedded system application ? and why ? 5+5+5

5. (*a*) Specify the sequence of events which is followed by AVR microcontroller in executing an interrupt request.

(*b*) Explain the hardware interrupt structure with their priority,vector address and triggering options.

(*c*) Write a program to initialize the interrupt and interrupt service routine that toggles PC2 whenever INT1 is triggered. Assume INT1 pin is connected to as witch which is at logic 1 when open. 5+5+5

6. (*a*) What are the two methods to measure time delay in Timer0 ? What will be the initial count in TCNT0 for both methods if delay equivalent to 100 clock cycles is desired ?

(*b*) Explain the Normal and CTC mode with diagram and the associated flags and interrupts.

(*c*) Using Timer 0, write a program to generate a square wave of any frequency on PB5 pin of Port B while transferring data from PORT C to PORT D. 5+5+5

7. (*a*) Draw a diagram to show how ASCII 41H is transmitted through UART serial transmission with 8 data bits, no parity and 1 stop bit. What is the baud rate if UBRR register has 51 (in decimal). Assume system clock frequency to be 8 MHz.

(*b*) Explain serial communication through SPI protocol.

(*c*) Explain the function of the following with reference to AVR ADC :

ADLAR

ADCH

ADCL

ADSC

ADIF. 5+5+5