**Assignment No.3**

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| **Title of Assignment:**  Write 64 bit ALP to convert 4-digit Hex number into its equivalent BCD number and 5 digit BCD number into its equivalent Hex number. Make program user friendly to accept the choice from user for: a) Hex to BCD b) BCD to Hex c) Exit. |
| **Relevant Theory:**  **Hex to BCD Conversion:-**  Important Note:-   1. Conversion from higher base number system to lower base number system requires the higher base number to be divided by the lower base.   For eg:- (n)16= (?)10  To convert divide n by 10  2) Conversion from higher base number system to lower base number system requires the higher base number to be divided by the lower base.  For eg:- (n)10= (?)16  To convert Multiply each bit of n by increasing power of 10 (start from LSB).  A) The Hexadecimal subroutine consists of two parts:-   1. Accepting a 4 digit hex number at once. 2. Dividing it with a base of a BCD number i.e. 10 3. Remainder of division is an answer; display it bit by bit in reverse order.   B) Processing of 4 digit hex number:-  Consider a 4 digit hex number can be expressed as PQRS     |  |  |  | | --- | --- | --- | | 10 | PQRS | R1 | | 10 | q1 | R2 | | 10 | q2 | R3 | | 10 | q3 | R4 | | 10 | q4 | R5 | |  | Until q becomes 0 divide by 10 |  |   Store remainder in reverse order that will give the conversion of Hex number  C) Algorithm:-  1) declare the variable temp &count  2)initialize temp=000AH&count=0000  3)accept four digit hex no. and store it in ax register  4)initialize dx=0000 to store remainder  5) divide hex no. in ax with temp(000ah) to get quotient in ax.  6) push rem. In dx register.  7) Inc count  8) cmp ax with 0 if not zero the go to step 5.  9) pop element and store in dx.  10) display dx and dec count.  11) repeat step 9 until count=0.  **BCD to Hex Conversion:-**  A) The BCD subroutine has two sequences of processing.  1) Extraction of the individual digits from the five-digit BCD number.  2) Conversion of the extracted data to hexadecimal in four-bit units.  B) BCD-to-hexadecimal conversion is carried out in the following way.   1. A four-digit BCD number given as D3D2D1D0 may be expressed as shown below.     2) Formula (2) in the above figure tells us that a four-digit BCD number can be converted to hexadecimal by finding  α = D3 × 10 + D2; and then  calculating β = α × 10 + D1 and  γ = β × 10 + D0.  3) The two-byte hexadecimal number is obtained by repeating the above steps, 2, five times.  C) Algorithm:-  1) Intialize count=5 and bx=0  2)initialize ax=000AH & count=0000  3) multiply ax with bx and move result in bx.  4)accept bcd number digit by digit.(MSB to LSB) in ax  5) add ax and bx.  6) dec count  7) cmp count with 0 if not got to step 3.  8) display bx which contains answer.  9) stop |
| **Mathematical Modeling:**  Let N be a given number of n digits, F(x) represents the hex function while F(y) represents the BCD function. Q and R represents a hex and BCD number respectively. For a given N the Conversion can be calculated as:-  Q= F(x) ; F(x)=BCD(N)  R= F(y) ; F(y)=Hex(N) |
| **Testing:**  **Test Conditions:**  Check for conversion for a specific known value of hex and BCD.  **Input:**  1) Hex to BCD: - give FFFF as input.  2) BCD to Hex: - give 65535 as input.  **Output:**  1) Hex to BCD: - 65535.  2) BCD to Hex: - FFFF. |
| **FAQs:**   1. How to convert Hex number to BCD. 2. How to convert BCD to Hex. 3. What is Hex equivalent of BCD 65535. 4. What is BCD equivalent of Hex FFFF. |
| **Conclusion:**  Successfully completion of converting a hex number to BCD number and vice versa. |