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| **Experiment No.** | 03 |

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|  | Program |
| **AIM:** | To obtain Auto-Correlation of given L point sequence x[n] and Cross-Correlation of L point sequence x[n] and M point sequence h[n] using C language. |
| **Objective:** | 1. To obtain Auto-Correlation of given L point sequence x[n] using C language. 2. To obtain Cross-Correlation of L point sequence x[n] and M point sequence h[n] using the C language. |
| **Software used:** | C- compiler |
| **Code:** | 1. **For Autocorrelation**   #include <stdio.h>  void main()  {  printf("Auto Correlation\n");  int x\_length = 0;  printf("\nEnter the length of x[n]: ");  scanf("%d", &x\_length); // length of x[n]  int x[x\_length];  printf("\nEnter the values of x[%d]: ", x\_length);  for (int i = 0; i < x\_length; i++)  scanf("%d", &x[i]); // values of x[n]  int y\_length = x\_length;  int y[y\_length];  int temp = 0;  for (int i = (y\_length - 1); i >= 0; i--)  {  y[i] = x[temp];  temp++;  }  int rxy\_length = x\_length + y\_length - 1; // length of Rxx[n] = L+M-1  int rxy[rxy\_length];  for (int i = 0; i < rxy\_length; i++)  rxy[i] = 0;  int offset = 0;  for (int i = 0; i < y\_length; i++)  {  for (int j = 0; j < x\_length; j++) // Multiplication, addition and shifting  rxy[j + offset] += y[i] \* x[j];  offset++;  }  printf("\nValues of Rxx[%d] are: ", rxy\_length);  for (int i = 0; i < rxy\_length; i++) // print y[n]  printf("%d ", rxy[i]);  printf("\n");  }   1. **For Cross Correlation**   #include <stdio.h>  int main()  {  printf("Cross Correlation\n");  int x\_length = 0;  printf("\nEnter the length of x[n]: ");  scanf("%d", &x\_length); // length of x[n]  int x[x\_length];  printf("\nEnter the values of x[%d]: ", x\_length);  for (int i = 0; i < x\_length; i++)  scanf("%d", &x[i]); // values of x[n]  int y\_length = 0;  printf("\nEnter the length of y[n]: ");  scanf("%d", &y\_length); // length of y[n]  int y[y\_length];  printf("\nEnter the values of y[%d]: ", y\_length);  for (int i = (y\_length - 1); i >= 0; i--)  scanf("%d", &y[i]); // values of h[n]  int rxy\_length = x\_length + y\_length - 1; // length of Rxy[n] = L+M-1  int rxy[rxy\_length];  for (int i = 0; i < rxy\_length; i++)  rxy[i] = 0;  int offset = 0;  for (int i = 0; i < y\_length; i++)  {  for (int j = 0; j < x\_length; j++) // Multiplication, addition and shifting  rxy[j + offset] += y[i] \* x[j];  offset++;  }  printf("\nValues of Rxy[%d] are: ", rxy\_length);  for (int i = 0; i < rxy\_length; i++) // print y[n]  printf("%d ", rxy[i]);  printf("\n");  } |
| **Output** | 1. **For Autocorrelation**      1. **For Cross Correlation** |
| **Conclusion**   1. Autocorrelation signal is an EVEN signal. i.e. y[n] = y[-n] 2. 2. If input signals are delayed, Then autocorrelation of delayed input signal is the same as that of autocorrelation of original signal. 3. Cross-correlation of input signal with delayed signal is same as advanced autocorrelated input signal. 4. When an input signal is scaled in cross correlation by a factor of ‘a’, then the output is also scaled by the same factor “a”. | |