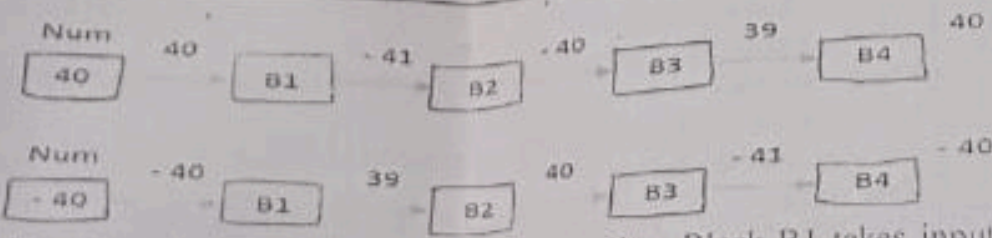
MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL
Department of Computer Science And Engineering
End Term Exam - November 2023

Course – B.TECH. Sem – I Section- A/B/C/D/E
Subject Name- Problem solving & Computer Programming Subject Code CS-104
Time- 3 hrs Max Marks-50
Note- Answer all questions.

S No	Question	Marks
Q1	KBC13's first crorepati is a blind girl who taught Amitabh Bachchan magic mathematics. She said that she can correctly answer the sum of first N consecutive positive odd numbers from 1 (i.e. 1+3+5+....) within a few seconds and without adding them. She answered sum is 16 for N=4, sum is 25 for N=5 and sum is 36 for N=6 and you can verify all her answers are correct. For N=4, sum =1+3+5+7 =16 N=5, sum =1+3+5+7+9 =25 N=6, sum =1+3+5+7+9+11 =36 *Write a C program to print* *(i) sum of first N consecutive positive odd numbers from 1* $2(M+1)$ *(ii)sum of first (P-M) consecutive positive odd numbers from* (M<P.) *Cross check your program whether it is printing 16 when N=4 and 20 when M=4 and P=6.* **Note : You can't use operators + or -(-), +=, -=. Like sum=(a+b), sum=a-(-b),sum +=a; sum -= b; are not allowed.**	5
Q2	 See the above diagram and understand its execution. Block B1 takes input Num entered at run time and each block B2,B3,B4 takes input from its immediate left side block. *All blocks* **execute a single C statement inside the block** (different blocks may execute the same or different C statement, but executes ONLY a single UNKNOWN statement. YOU NEED TO FIND & USE UNKNOWN STATEMENT of each block in your program) and produces output which acts as an input to the immediate next block. Block B4 produces output which is exactly the same as input Num.	3+2

	Write a C program to take input Num from the user and execute **the C statements inside the blocks, block by block** as shown in above diagram. Finally display the output of block B1,B2,B3,B4. Your class roll_no is from 1 to 110. Run your code and show the output with your own -roll_no and +roll_no as input Num. **NOTE : - (1) You can't use unary minus(-) and binary minus(-) operators in the whole program.**	
Q3	An automorphic number is a number whose square ends with the same digits as the number itself. All below numbers 5,25,376 are automorphic numbers. Ex- Num=**5**, Square(5)=25 Num=**25**, Square(25)=625 Num=**376**,Square(376)2=141**376** Write a program in C to check whether a number entered by the user at run time is Authomorphic or not.	5
Q4	Write a program using any nested loop to print this pattern. Users will enter no of rows N at run time. N=5 9 8 7 6 5 4 3 2 1 9 8 7 6 * 4 3 2 1 9 8 7 * * * 3 2 1 9 8 * * * * * 2 1 9 * * * * * * * 1	5
Q5	Write a program for password validation to check whether a password contains at least one lowercase, one uppercase, one number and one special character. **Rules to set Password -** (1) Length should be 8 or more characters, but max 50 characters. (2) It should NOT contain 3 consecutive numeric values (i.e. 567 is not acceptable , but 517 is acceptable) (3) It should NOT contain 3 same numeric values consecutively (i.e. 444 is not acceptable, but 414 is acceptable). (3) It should NOT contain 3 same alphabets consecutively (i.e. aaa is not acceptable, but aba is acceptable). **Test data:** Ajay@123 – Not accepted (Error: contain 3 consecutive numeric values) Ajay@111 - Not accepted (Error: 3 same numeric values consecutively) Ajayyy@628 - Not accepted (Error: 3 same alphabets consecutively) Ajay@781 - Accepted as a strong password.	5
Q6	Write a program to print all odd numbers between M and P using a recursive function Rec_ODD(int,int). Rec_ODD(1,10) will display 1,3,5,7,9, Rec_ODD(2,10) will display 3,5,7,9,	5

Q7	Consider Matrix A[2][3] = {1,2,3,4,5,6} and Matrix B[3][2] = {6,5,4,9,8,7} are given. Show how you multiply Matrix A and Matrix B and store results in Matrix C[2][2] as per mathematics. Now, represent C[row][col] in terms of the equations of A[row][col] and B[row][col] for above example for every possible value of row and col. How many total no of loops you need to use to compute the multiplication of the above matrix?	2+2+1
Q8	Write a program to create a structure Employee which has following members - Name of 50 characters length, int Age, int Roll_in_job, float salary. Create a variable - array of structure Employee and store data of two employees. Print the Name, Age, Job_Profile and Salary. Print Job_Profile of an employee as Manager if Roll_in_job is 1 otherwise "Normal Employee".	5
Q9	What will be the output for the following C codes? Assume <stdio.h> header file is included. **Marks will be awarded only for correct output of the corresponding program.**	1x10

(A)
```
int main() {
    int i = 3;
    int l = i / -2;
    int k = i % -2;
    printf("l=%d, k=%d\n", l, k);
    return 0;
}
```

(B)
```
main() {
    int i = 0, j = 0;
    if(i++ == j++)
        printf("i=%d,j=%d", i--, j--);
    else
        printf("i=%d,j=%d", i, j);
}
```

(C)
```
int main() {
    int count = 0,num =435;
while (num)
{
        count++;
        num >>= 1;
}
    printf("count:%d",count);
    return 0;
}
```

(D)
```
struct abc
    {
        int i ;
        char b;
        float c;
    };
    int main()
    {
        printf("%d",
sizeof(abc));
    }
```

(f)
```
int main() {
    int a=14,b=23,c=12,d=90;
  //d is extra in below printf
statement
printf("A[=%d, B[=%d,
C[=%d\n",a,b,c,d);
  return 0;
}
```

(f) main() {
```
    char inchar = 'A';
    switch (inchar)
    {
        printf("Always \n");
    case 'A' :  printf ("choice
A\n");
    case 'B' :  printf ("choice
B ") ;
    case 'C' :
    case 'D' :
     default: printf ("No
Choice") ;
    }
}
```

(g)
```
int main()
{
  int x = 10;
  if(x++ + 10)
  printf("%d", x);
}
```

(h)
```
int main()
{
  int x;
  for(x=10; x<=15; ++x);
  printf("%d", x);
}
```

(i)
```
int main()
{
  int x = 20;
  do
      printf("%d\n ", x);
  while(x++<=20);
  return 0;
}
```

(j)
```
int main()
 {
     char chr = 128;
     printf("%d\n", chr);
     return 0;
 }
```