

B.E.T.C.E 1st Year 1st Semester Examination - 2018

Computer Programming and Numerical Analysis Time: 3 hours Full Marks: 100

Answer Q.1 and any five questions from Group A and any three questions from Group B.

Q.1. (a) Find the output of the following piece of C code:

```
main()
{ int a=10, b=20, x, y;
  x = a++;
  y = ++b;
  printf("%d %d %d %d", x, y, a, b);
}
```

(b) Find the output of the following piece of C code:

```
int func (int x)
{
  if(x <= 0)
    return (1);
  return func (x- 1) + x;
}
main()
{
  printf("%d\n", func(5));
}
```

(c) Find the output of the following piece of C code:

```
main()
{
  int arr[] = {0,1,2,3,4};
  int i, *p;
  for(p=arr, i=0; p+i < arr + 4; p++, i++)
    printf("%d ", *(p+i));
}
```

(d) Find the output of the following piece of C code:

```
main()
{
  char s[] = "Programming!"
  printf("%c", *(s + strlen(s) - 1));
}
```

(e) Differentiate between *fscanf* and *fread* functions in C.

(f) Explain the meaning of the C declaration: `int *p (char *a[])`

(g) Write C declaration to create a node of a linked list with a data term of type integer.

Group A

- Q.2 (a) Differentiate between the *scanf* and the *printf* functions in C with suitable examples. 4
 (b) Write a C program to check whether an inputted year is a leap-year. 6
- Q.3 (a) Differentiate between branching and looping in C. 4
 (b) Write a C program to print a diamond of stars. The number of rows in the diamond will be inputted by the user. 6
- Q.4 (a) Differentiate between *library functions* and *user-defined functions* with examples. 4
 (b) Write a C program with a function to check the *number of palindrome* numbers in $[a, b]$. The user should input the values of a and b . Conform to the top-down programming approach. 6
- Q.5 (a) Discuss the importance of '*' and '&' operators in connection with pointers. 4
 (b) Write a C program to first create an integer array with n elements and then obtain its largest element using a separate function. The user should input the value of n . Access array elements using pointers. Conform to the top-down programming approach. 6
- Q.6 (a) Write your own C function *mystrcat* to simulate *strcat* function in C. Complete program is not necessary. Can you use another C function to check the correctness of your simulation? 4
 (b) Write a C program to *delete all the vowels* in an inputted string. For example, if the input string is "ETCE", the output string will be "TC". Assume your input string to contain a maximum of 100 characters. 6
- Q.7 (a) Write a C program to populate information for 1000 employees in an organization. Each employee should have an id, name (maximum 50 characters), age and address (maximum 100 characters). Add a search function to your program which will return entire employee record when the database is searched with an id. 7
 (b) Write C statement to calculate the storage space in (a). Actually evaluate the amount of storage. 3

Group B

Q.8. (a) Show how one can numerically obtain a root of an equation using *Secant* method.

(b) Use the method in (a) to compute a real root of $e^x - 3x - \sin x = 0$ correct to four decimal places. Assume the root lies between 0 and 1.

4+8

Q.9. (a) Explain why numerical methods are necessary for solving a set of simultaneous algebraic equations.

(b) Solve the following set of simultaneous algebraic equations using a suitable numerical method:

$$1.00x_1 + 0.42x_2 + 0.54x_3 + 0.66x_4 = 0.3$$

$$0.42x_1 + 1.00x_2 + 0.32x_3 + 0.44x_4 = 0.5$$

$$0.54x_1 + 0.32x_2 + 1.00x_3 + 0.22x_4 = 0.7$$

$$0.66x_1 + 0.44x_2 + 0.22x_3 + 1.00x_4 = 0.9$$

3+9

Q.10. (a) Explain what do you mean by fitting a curve in the least square sense.

(b) Fit a curve of the type $y = \frac{1}{(a+bx)}$ to the following data in the least square sense:

x	0	1	2	3	4	5	6	7	8	9
y	11.0	3.33	2.20	1.52	1.00	0.91	0.82	0.66	0.56	0.49

3+9

Q. 11 (a) Compare and contrast Trapezoidal and Simpson's rules for numerical integration.

(b) A rocket is launched from the ground vertically upwards. Its acceleration (a) is registered during the first 80 seconds and is given in the following table.

Time(s)	0	10	20	30	40	50	60	70	80
a(m/s ²)	30.00	31.63	33.44	35.47	37.75	40.33	43.29	46.69	50.67

Find the velocity of the rocket at i) time $t = 50$ s and ii) time $t = 80$ s.

4+8