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Candidates Seat No. \_\_\_\_\_



## GUJARAT UNIVERSITY

**B.E. Sem. – IV (Mech./Auto.) [New] Examination**  
**Computer Programming & Numerical Methods**

Thursday, 1<sup>st</sup> June, 2006]

[Time: 10-30 a.m. To 1-30 p.m.]

[Max.Marks : 100]

- Instructions :** (1) Attempt all questions.  
 (2) Answers to both the sections must be written in separate answerbooks.  
 (3) Figures to right indicate marks.  
 (4) Assume suitable data if necessary.

### SECTION – I

1. (a) In equation  $ax^2 + bx + c = 0$   
 if  $b^2 - 4ac = 0$ , then the number of roots is one 16  
 if  $b^2 - 4ac > 0$ , then the number of roots is two and  
 if  $b^2 - 4ac < 0$ , then no roots.  
 The equation to find the roots is as follows :

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For above, write a program to read the values of a, b, c and computes the roots. If no roots are there, the program should print appropriate message.

- (b) Write a C program to find sum of series  $1 - 2 + 3 - 4 + \dots n$  where  $n = 100$ .

**OR**

1. (a) Write "C" Programme to give following output using nested loop. 16
- ```

1
2 3
4 5 6
7 8 9 10

```
- (b) Write "C" Programme for summation of two  $3 \times 3$  matrices.
2. (a) Write a "C" Programme to find and replace a particular word by another word in a given string. 16  
 For Example, the word "machine" should be replaced by the word "operation" in the sentence "Drilling machine Milling machine Grinding machine."  
 (b) Write a Programme using pointers to compute the sum of all elements stored in an array.

**OR**

2. (a) The following data about some of the elements from the periodic table is required to be stored in the computer memory. 16

| Name     | Symbol | Atomic No. | Atomic Weight |
|----------|--------|------------|---------------|
| Hydrogen | H      | 1          | 1.00          |
| Oxygen   | O      | 16         | 16.00         |
| Carbon   | C      | 12         | 32.00         |
| Chloride | Ch     | 23         | 35.5          |

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2021 / 2

Note the both name and symbol are array of characters, atomic number is an integer number and atomic weight is a real number. Declare a structure named element to store the information about any element if the name is given.

(b) Write a programme for sorting of any array using pointers only.

3. Attempt Any Six :

18

- (a) Explain the difference between fprintf and printf
- (b) Explain the difference between getch and getc
- (c) Explain strcat() and strcmp() functions
- (d) Write in brief the difference between object oriented programming and procedure oriented programming.
- (e) Enlist different operators used in "C"
- (f) What is structure ? How does a structure differ from an array ?
- (g) What is the scope of a variable within a programme.
- (h) Assume the variable string contains the value "C IS A WONDERFUL PROGRAMMING LANGUAGE." determine the output of the following expressions.
  - (i) for (i=0; string [i] != "."; i++)  
Printf ("%C", string[i]);
  - (ii) printf ("%20.45", string);
  - (iii) printf ("%5S", string);

SECTION - II

4. (a) Write a C++ Programme that will ask for Fahrenheit and display it in Celsius.

16

$$^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$$

(b) Write a programme in C++ to generate the following

```

*       *       *       *       *       *       *
*       *       *       *       *
*       *       *       *
*
    
```

OR

4. (a) Write an algorithm for Newton Raphason method.

16

Find the value of  $\sqrt[3]{17}$  by using appropriate method, starting with the initial approximation  $x_0 = 2$ .

(b) Write a programme for Simpson's  $\frac{1}{3}$  rule.

5. (a) Write an algorithm for the interpolation. Using Newton's forward formulae.

16

Using Gauss's forward formulae, evaluate  $f(3.75)$  from the table :

|    |        |        |        |        |        |        |
|----|--------|--------|--------|--------|--------|--------|
| x: | 2.5    | 3.0    | 3.5    | 4.0    | 4.5    | 5.0    |
| y: | 24.145 | 22.043 | 20.225 | 18.644 | 17.262 | 16.047 |



(b) Write a programme for Gauss Elimination method of solving linear simultaneous equation.

OR

5. (a) Write a programme for Runge – kutta 4th order method for finding the solution of ordinary Differential Equation. 16

Solve the equation  $\frac{dy}{dx} = \frac{1}{x+y}$ ,  $y(0) = 1$  for  $y(0.1)$  and  $y(0.2)$ , using Runge-kutta method of the fourth order.

(b) Solve the following system of equations by Gauss Jordan method

$$10x_1 + x_2 - x_3 = 11.19$$

$$x_1 + 10x_2 + x_3 = 20.08$$

$$-x_1 + x_2 + 10x_3 = 35.61$$

6. Attempt Any Six :

18

(a) Find by Taylor's series method, the value of  $y$  at  $x = 0.1$  if  $\frac{dy}{dx} = x - y^2$  and  $y = 1$  at  $x = 0$

(b) Describe various kind of errors with suitable example.

(c) Find real root of equation  $f(x) = \cos x - xe^x$  using method of false position.

(d) Consider the function given below :

|       |          |         |         |           |         |
|-------|----------|---------|---------|-----------|---------|
| x:    | 0.8      | 0.9     | 1.0     | 1.1       | 1.2     |
| f(x): | 0.717236 | 0.78333 | 0.84147 | 0.0092314 | 0.96356 |

Evaluate  $\int_{0.8}^{1.2} f(x)dx$  by using Simpson's  $\frac{1}{3}$  rule.

(e) Find the general solution of the difference equation  $u_{n-2} - u_{n+1} + \left(\frac{1}{4}\right)u_n = 0$

(f) Draw a flow chart for Trapezoidal rule of numerical integral.

(g) Integrate  $\int_1^2 \frac{1}{x} dx$  using Trapezoidal rule and find the actual error.

(h) What is flow – chart ? Enlist various symbols used in flow – chart.

4/727

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Candidate's Seat No

**GUJARAT UNIVERSITY**  
**B. E. Sem IV (Mechanical/Auto.) Examination**  
**Computer Programming & Numerical Method**

Saturday, 2nd June, 2007]

[Time : 3 Hours

Max. Marks : 100

- Instructions :** (1) Attempt all questions from each section.  
(2) Answer to the two sections must be written in separate answer books.  
(3) Figures to the right indicate full marks.  
(4) Assume suitable data if necessary.

**SECTION I**

- 1 (a) Write a "C" Program to give following output using nested loop. 16  
A  
B C  
D E F  
G H I J  
(b) Write a "C" Program which generates Fibonacci series for first n numbers.  
For example Fibonacci series for first 9 numbers is as follows.  
0 1 1 2 3 5 8 13 21.....

**OR**

- 1 (a) Write a "C" Program to do the following: 16  
1. To output the question " who is the inventor of C?"  
2. To accept an answer.  
3. To print out "Good" and then stop if the answer is correct.  
4. To output the message "try again" if the answer is wrong.  
5. To display the correct answer when the answer is wrong even the third attempt and stop.  
(b) Write a program which finds the largest and smallest number from the given list of Numbers using an array.
- 2 (a) Write a function **exchange** to interchange the value of two variables, say x and y. 16  
Illustrate the use of this function, in a calling function.  
(b) Write a program (using pointer parameter) that reverse the elements of given array.

**OR**

- 2 (a) Define a structure data type called time containing three members integer hour, minute and second. Develop a program that would assign values to the individual members and display the time in the following form. 16  
11:39:45  
(b) A file named **DATA** contains a series of integer numbers. Code a program to read these numbers and then write all " odd" numbers to a file to be called **ODD** and all "even" numbers into a file called **EVEN**.

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## 3 Attempt any Six :

(a) Explain difference between union and structure.

(b) Explain following:

- I. goto
- II. break

(c) Explain difference between while and do.....while loop.

(d) Explain fseek() and fopen() functions.

(e) List different category of functions.

(f) Explain an array with example?

(g) Give the output of the following programs.

```
float a,x;
int b,c,d;
```

```
a=3.1456;
```

```
b=14;
```

```
c=13.90;
```

```
case 1:
```

```
x=a*b-c/a+b;
```

```
d=a/b+2*c/4-15;
```

```
printf("%f",x);
```

```
printf("%d",d);
```

```
case 2:
```

```
x=(int) a*b-c/a+b;
```

```
d=(float)a/b+2*c/4-15;
```

```
printf("%f",x);
```

```
printf("%d",d);
```

(h) Give the output of the following programs. Assume any memory addresses for x,y,p.

```
main()
{
    int x,y;
    int *p;
    x=25;
    p=&x;
    y=*p;

    printf("%d is stored at addr %u\n", *&x,&x);
    printf("%d is stored at addr %u\n",p,&p);
    *p=12;
    printf("x=%d \n",x);
}
```

4-3

## SECTION-II

- 4 (a) Write a program in C++ to find out the synchronous speed of a motor if frequency and No. of poles are given  
 $N=120*f/p$  08
- (b) Attempt any Two: 08
- I. List the difference between any C and C++.
- II. Write a C++ program to find the sum of following series  
 $\cos x = 1 - x^2/2! + x^4/4! \dots$
- III. Write a program in C++ to generate the following series.
- \*  
\* \* \*  
\* \* \* \* \*

OR

- 4 (a) Write an algorithm for Bisection method to find Root. 08  
 Find the root of the following equation.  
 $f(x) = x^2 - 3x + 2$  Using Bisection method.
- (b). Write a program for Simpson's 3/8 rule. 08
- 5 (a) Write a program for Runge-kutta 4<sup>th</sup> order method for finding the solution of ordinary differential equation. 16  
 Solve the equation  $y'(x) = x^2 + y^2$ ,  $y(0) = 0$  for  $y(0.4)$ , using Runge-kutta method of the fourth order. Assume  $h = 0.2$
- (b) Solve the following equations by Picard's method
- I.  $y'(x) = x^2 + y^2$
- II.  $y'(x) = xc^y$ ,  $y(0) = 0$  and estimate  $y(0.1)$ ,  $y(0.2)$  and  $y(1)$ .  
 State the formula of Picard's method to solve the differential equation of type  $dy/dx = f(x,y)$  What are its limitations?

OR

- 5 (a) Obtain the solution of the following system using an appropriate iteration method and Justify. 16
- $$\begin{aligned} 2x_1 + x_2 + x_3 &= 5 \\ 3x_1 + 5x_2 + 2x_3 &= 15 \\ 2x_1 + x_2 + 4x_3 &= 8 \end{aligned}$$
- (b)
- I. Solve the following system of equations by simple Gauss elimination.
- $$\begin{aligned} 2x_1 + 3x_2 + 4x_3 &= 5 \\ 3x_1 + 4x_2 + 5x_3 &= 6 \\ 4x_1 + 5x_2 + 6x_3 &= 7 \end{aligned}$$
- II. Solve the following system using Gauss-Jordan method.
- $$\begin{aligned} 2x_1 + 4x_2 - 6x_3 &= -8 \\ x_1 + 3x_2 + x_3 &= 10 \\ 2x_1 - 4x_2 - 2x_3 &= -12 \end{aligned}$$

P. T. O.

## 6 Attempt any Six :

18

- (a) Discuss the difference between Bisection method and False Position method.
- (b) Find the general solution of the difference equation.  

$$U_{n-2} - U_{n+1} + (1/4) U_n = 0$$
- (c) Solve the following system by using LU decomposition method.  

$$\begin{aligned} 3x_1 + 2x_2 + x_3 &= 10 \\ 2x_1 + 3x_2 + 2x_3 &= 14 \\ x_1 + 2x_2 + 3x_3 &= 14 \end{aligned}$$
- (d) Estimate the value of  $\sin \theta$  at  $\theta = 25^\circ$  using the Newton-Gregory forward method. difference formula with the help of the following table.

|               |        |        |        |        |        |
|---------------|--------|--------|--------|--------|--------|
| $\theta$      | 10     | 20     | 30     | 40     | 50     |
| $\sin \theta$ | 0.1736 | 0.3420 | 0.5000 | 0.6428 | 0.7660 |

- (e) Given the following set of data points, obtain the table of divided differences. Use the table to estimate the value of  $f(1.5)$ .

|          |   |   |    |    |     |
|----------|---|---|----|----|-----|
| $i$      | 0 | 1 | 2  | 3  | 4   |
| $x_i$    | 1 | 2 | 3  | 4  | 5   |
| $f(x_i)$ | 0 | 7 | 26 | 63 | 124 |

- (f) Write an algorithm for Lagrange interpolation polynomial.
- (g) Discuss underflows and overflows condition of a floating point number.
- (h) Define Heun's method.