

# ARYABHATTA KNOWLEDGE UNIVERSITY

FM – 70    **NMCT**    **211404**

4<sup>TH</sup> SEM. 2013

**Attempt any five questions in which question no 1 is compulsory**

1.    Answer **any seven** from the following:

(a) In C++ ,a mathematical expression  $137\% 10$  yields

(i) 13

(iii) 0

(iv) 7

(b) Which of the following statements is true about the break statement?

(i) A break statement causes an exit only from the innermost loop

(ii) A break statement causes an exit only from the innermost switch

(iii) A break statement causes an exit only from all loops and switches

(iv) A break statement causes an exit from the innermost loop or switches

(c) What is the process of converting one predefined type into another called?

(i) Type casting

- (ii) Expression
- (iii) Type promotion
- (iv) Type conversion

(d) The assignment statement  $a-=b$ ; can also be written as

- (i)  $a=b-1$
- (ii)  $a=a-b$
- (iii)  $a=a-(-b)$
- (iv)  $a=b-a$

(e) the operator which is used to access the address of a variable is

- (i)  $\&$
- (ii)  $\#$
- (iii)  $@$
- (iv)  $*$

(f) What do you mean by a difference equation?

(g) Define the order and degree of a difference equation with examples.

(h) What is the difference between an initial value problem and a boundary value problem ?

(i) What do you mean by the order of convergence of an iterative method for finding the root of the equation  $f(x)=0$  ?

(j) When is the convergence of an iterative method for solving the equation  $f(x)=0$  said to be (i) linear and (ii) quadratic?

2. (a) find the root of the equation  $x \tan x = 1.28$ , that lies between 0 and 1, correct to two places of decimals, by bisection method

(b) Write a computer program using C/ C++ for the above equation using bisection method.

3. (a) Find the Newton- raphson iterative formula for the reciprocal of a number N and hence find the value of  $1/23$ , correct to 5 decimals.

(b) Write a computer program using C/C++ to find the smallest positive root /the largest negative root of the equation  $f(x)=0$  , by using the simple iterative method.

4. Solve the following system of equations by Jacobi's iteration method and gauss-seidel's method:

$$10x_1 + 2x_2 + x_3 = 3$$

$$x_1 + 10x_2 - x_3 = -22$$

$$-2x_1 + 3x_2 + 10x_3 = 22$$

5. The population of a town Patna in the census is as given in the data. Estimate the population in the year 1996

using Newton's forward interpolation and backward interpolation formulae:

<b>Year(x)</b>	<b>1961</b>	<b>1971</b>	<b>1981</b>	<b>1991</b>	<b>2001</b>
<b>Population (in 1000's approx)</b>	<b>46</b>	<b>66</b>	<b>81</b>	<b>93</b>	<b>101</b>

6. (a) fit a curve of the form  $xy = a + bx^2$  to the following data by the method of least square :

<b>X</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>6</b>	<b>8</b>
<b>Y</b>	<b>5.43</b>	<b>6.28</b>	<b>10.32</b>	<b>14.86</b>	<b>19.51</b>

(b) Write a computer program using C/C++ to fit a straight line of the form  $xy = a + bx^2$  taking the above data, using the method of least square.

7. The velocity of a particle at distance s from a point on its linear path is given in the following data :

<b>S(m)</b>	<b>0</b>	<b>2.5</b>	<b>5.0</b>	<b>7.5</b>	<b>10.0</b>	<b>12.5</b>	<b>15.0</b>	<b>17.5</b>	<b>20.5</b>
<b>V(m/sec)</b>	<b>16</b>	<b>19</b>	<b>21</b>	<b>22</b>	<b>20</b>	<b>17</b>	<b>13</b>	<b>11</b>	<b>9</b>

distance of 20 meters , using Simpson's one-third rule.

8. (a) Find the value of  $y(1.1)$  ,using runge-kutta method of the fourth order , given that  $dy/dx = y^2 + xy$  ; $y(1)=1$

(b) Write a computer program using C/c++ to solve the above differential equation at specified pivotal points, using runge – kutta method of the fourth order.

9. Solve the boundary value problem  $v''(x) - xy(x) = 0$  for  $x_i = 0, 1/3, 2/3, 1$ , given that  $y(0) + y'(0) = 1$  and  $y(1) = 1$ .