SE451

Total No. of Printed Pages:02

S.E. (Civil) Semester- IV (Revised Course 2007-08)
EXAMINATION Nov/Dec 2019
Numerical Methods in Computer Programming

[Duration : Three Hours] **[Total Marks : 100]**

Instructions:
1) Attempt any five questions, atleast one from each module.
2) Assume suitable data if necessary.

MODULE I

Q.1
a) Express $3x^4 - 4x^3 + 6x^2 + 2x + 1$ in the factorial notation. Hence find all differences. **(6)**
b) Calculate $f(0.7)$ from the following table. **(8)**

x	0.1	0.2	0.3	0.4	0.5	0.6
y	2.68	3.04	3.38	3.68	3.96	4.21

c) State and prove Newton's forward interpolation formula. **(6)**

Q.2
a) Using Stirling's formula find $y_{1.22}$, given $y_{0.1} = 0.841$, $y_{1.1} = 0.891, y_{1.2} = 0.932, y_{1.3} = 0.963, y_{1.4} = 0.985$. **(6)**
b) Using Lagranges interpolation formula find $f(2000)$ from **(7)**

x	1997	1999	2001	2002
y	43	65	159	248

c) Write a C program to implement Newton's divided difference interpolation formula. **(7)**

MODULE II

Q.3
a) Find a root of $e^x - x^2 - 2 = 0$ using Secant method. **(6)**
b) Explain graphically Regula-Falsi method and find a real root of $x \tan x + 1 = 0$. **(8)**
c) Write a C program to implement Newton Raphson method. **(6)**

Q.4
a) Evaluate $\int_0^1 \frac{ex}{x+2} dx$ by Simpson's $\frac{1}{3}$rd rule. **(6)**
b) Given **(7)**

t	1	2	3	4	5	6	7
f(t)	91	85	90	93	88	80	70

Evaluate $\int_0^7 f(t)\, dt$ by using Weddle's rule.

c) Write the C program to implement Trapezoidal rule for numerical integration. **(7)**

CB73D8065034A0BF9B3C0C64529962D6

MODULE III

Q.5

a) Evaluate $y(0.1)$ correct to 4 places of decimals using Taylor's series method if $\frac{dy}{dx} x^2 + y^2, y(0) = 1.$ **(6)**

b) Using Modified Euler's method, solve the following problem at $x = 0.1, 0.2$ $y' = 1 - y, y(0) = 0.$ **(6)**

c) Write flow-chart and C program to implement Euler's formula to solve initial value problem. **(8)**

Q.6

a) By Runge - Kutta method of order 4 solve the equation $\frac{dy}{dx} = xy + y^2$ with $y(0) = 1$, for $y(0.1), y(0.2)$. **(7)**

b) By Milne's Predictor-Corrector method solve $\frac{dy}{dx} = 2e^x - y$ at $x = 0.4$ given $y(0.1) = 2.01, y(0.2) = 2.04, y(0.3) = 2.09$ **(6)**

c) Write C program to implement Runge - Kutta method of order four. **(7)**

MODULE IV

Q.7

a) Employ Bendre-Schmidt method to solve the heat equation **(10)**

$$\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}, 0 < x < 1$$
$$u(0,t) = u(1,t) = 0$$
$$u(x,0) = x(1-x), h = 0.1, T = 0.015.$$

b) Solve the wave equation $4\frac{\partial^2 u}{\partial x^2} = \frac{\partial u^2}{\partial t^2} = 0$ for $0 < x < 5$, at $T = 2.0$, given that $u(0,t) = u(5,t) = 0$, **(10)**

$$u(x,0) = f(x), \frac{\partial u}{\partial t}(x,0) = 0$$
$$f(x) = x(5-x), h = 1, k = 0.5$$

Q.8

a) Solve the following system of equations by Gauss Jacobi method. **(10)**

$$5x + 2y + z = 12$$
$$x + 4y + 2z = 15$$
$$x + 2y + 5z = 20$$

b) Solve the following system of equations by Gauss Jordan method. **(10)**

$$2x + 2y + z = 6$$
$$4x + 2y + 3z = 4$$
$$x + y + z = 0$$

CB73D8065034A0BF9B3C0C64529962D6