GANPAT UNIVERSITY

B. Tech. Semester: IV Electrical Engineering

Regular Examination April - June 2015

### 2EE404 : Computer Oriented Numerical Methods

Time: 3 Hours

Total Marks: 70

Instruction:
1. Figures to right indicate full marks.
2. Use section-wise separate answer-book.
3. Figures to right indicates full marks.
4. Assume suitable data wherever needed.

SECTION - I

Q – 1 **(A)** Solve following equations by Gauss-Seidal method. [06]
$3x - 0.1y - 0.2z = 7.8$; $0.1x + 7y - 0.3z = -19.3$; $0.3x - 0.2y + 10z = 71.4$.

(B) Find a root of $x - \cos x$, correct to three decimal places using the secant method [06]

OR

Q – 1 **(A)** In a given electrical network, derive the equations for the current i_1, i_2 and i_3 and [07] find the value of said current using Gauss Elimination Method.
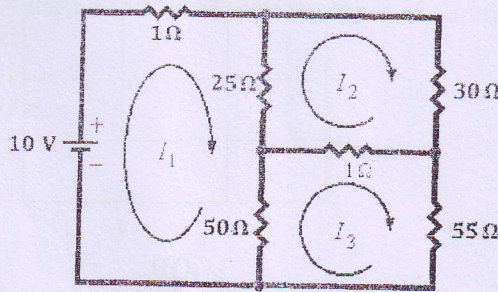
(B) Using Bisection method find the solution of $xe^x - 3 = 0$. Consider the accuracy three [05] decimal places.

Q – 2 **(A)** Apply Runge-Kutta Method of order 4 to find the approximate value of y for $x = 0.2$, [06] in steps of 0.1, if $\frac{dy}{dx} = x + y^2$, given that $y = 1$ when $x = 0$.

(B) Given $\frac{dy}{dx} = \frac{y - x}{y + x}$ with initial condition $y = 1$ at $x = 0$. Find y for $x = 0.1$ using Euler's [05] Method.

OR

Q – 2 **(A)** Obtain y at $x = 0.1$ and 0.2. using modified Euler's method Given $y' = 1 - y$ and [06] $y(0) = 0$.

(B) Using Milne's method find $y(4.4)$ given $5xy' + y^2 - 2 = 0$ given that $y(4) = 1$; [05] $y(4.1) = 1.0049$; $y(4.2) = 1.0097$; $y(4.3) = 1.0143$; $y(4.4) = 1.0187$.

Q – 3   Attempt any three.   [12]

(A) Using Newton-Raphson method, find a root of equation $2x = 7 + log_{10} x$ correct up to 3 decimal places.

(B) Compute the value of $\int_0^1 \frac{x^2}{1+x^3} dx$ using Trapezoidal rule.

(C) Find the $y'(0)$ and $y''(0)$ from the table given below :

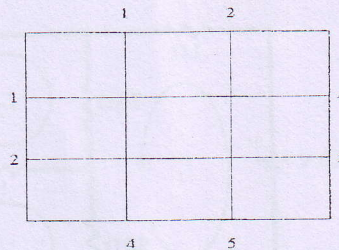| x :	0	1	2	3	4	5
y :	4	8	15	7	6	2

(D) Calculate the value of $\int_0^\pi sin x \ dx$ using Simpson's $\frac{1}{3}$rd rule.

SECTION – II

Q – 4   (A) Find $f(22)$ from the following data using Newton's Backward Interpolation formulae.   [06]

x:	20	25	30	34	40	45
$f(x)$:	354	332	291	260	231	204

(B) Solve the equation $u_{xx} + u_{yy} = 0$ for the square mesh with the boundary values as shown in figure. Calculate upto 4th iteration.   [06]

OR

Q – 4   (A) Using Lagrange's interpolation, calculate the profit in the year 2000 from the following data: [06]

Year	1997	1999	2001	2002
Profit in Lakhs of Rs.	43	65	159	248

(B) Using shooting method, solve the boundary value problem   [06]

$$\frac{d^2y}{dx^2} = 6y^2, y(0) = 1, y(0.5) = 0.44$$

Q – 5   (A) Form a table of differences for the function $f(x) = x^3 + 5x - 7$ for $x = -1, 0, 1, 2, 3, 4, 5$. Continue to table to obtain $f(6)$.   [06]

(B) The resistance R of a carbon filament lamp was measured at various values of the voltage V and the following observations were made: **[05]**

V :	62	70	78	84	92
R :	73	70.7	69.2	67.8	66.3

Assuming a law of the form $R = \dfrac{a}{V} + b$, find by graphical method the best values of a and b.

OR

Q – 5 **(A)** Solve the Poisson equation $u_{xx} + u_{yy} = -81xy, 0 < x < 1, 0 < y < 1$, given that $u(0,y) = 0, u(x,0) = 0, u(1,y) = 100, u(x,1) = 100$ and $h=1/3$. **[06]**

(B) What are the basic sources of errors in numerical computation? Explain with suitable block diagram. **[05]**

Q – 6 **Attempt any two.** **[12]**

(A) Explain the finite difference method to solve the boundary value problems.

(B) Construct the table of differences for the data:

x :	0	1	2	3	4
f(x) :	1.0	1.5	2.2	3.1	4.6

(C) Develop the normal equations for the following types of curves:
(a) $y = ax + bx^2$
(b) $xy^a = b$
(c) $y = ax^2 + b/x$

END OF PAPER