Student Exam No:-_____

GANPAT UNIVERSITY
M.TECH SEM-I ELECTRICAL ENGINEERING
REGULAR EXAMINATION JAN-2013
3EE101:-NUMERICAL TECHNIQUES

Time: 3 Hours **Total Marks:-70**

Instructions: - 1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

SECTION-I

Q:1 **(A)** Using Newton's divided difference formula find f(x) as the polynomial in x for the table: **(6)**

x:	0	1	2	4	5	6
y:	1	14	15	5	6	19

(B) The following table gives the corresponding values for pressure p and specific volume v of a superheated steam **(6)**

v:	2	4	6	8	10
P:	105	42.7	25.3	16.7	13

Find the rate of change of pressure with respect to volume when v=2.

OR

Q:1 **(A)** Calculate $\int_0^{10} \frac{dx}{1+x^2}$ by using **(6)**
(i)Trapezoidal Rule (ii)Simpson's $1/3^{rd}$ rule

(B) The result of measurement of electric resistance R of a copper wire at various temperatures is listed below: **(6)**

t:	19	25	30	36	40	45	50
R:	76	77	79	80	82	83	85

Using the method of least square, find the straight line R= $a+bt$ that fits best in the data.

Q:2 **(A)** Solve the simultaneous equations, **(6)**
$2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$, by using gauss elimination method.

(B) Solve the equations **(5)**
$5x - y + z = 10$, $2x + 4y = 12$, $x + y + 5z = -1$, by using Jacobi's method.

OR

Q:2 **(A)** Apply Runge-Kutta method to find approximate value of y for $x = 0.2$, in steps of 0.1, if $\frac{dy}{dx} = x + y^2$ given that $y = 1$ for $x = 0$. **(6)**

(B) Using simple Euler's method, solve for y at x = 0.1, from $\frac{dy}{dx} = x + y + xy$, $y(0) = 1$, taking step size h = 0.025. **(5)**

Q:3 **Attempt any two:** **(12)**

(A) Using Lagrange's formula, find $\log_{10} 310$ from the following data:

x:	300	304	305	307
log_{10} *x:*	2.4771	2.4829	2.4843	2.4871

(B) The area of a circle diameter d is given for the following values:

d:	80	85	90	95	100
A:	5026	5674	6362	7088	7854

Calculate the area of a circle of diameter 105.

(C) Derive the Newton's forward interpolation formula.

SECTION-II

Q:4 (A) Solve $x^4 - 5x^3 + 20x^2 - 40x + 60 = 0$, given that all the roots of the equation are complex, by using Lin-Bairstow's method. **(6)**

(B) Write and explain the two limitations of Newton-Raphson method. **(6)**

OR

Q:4 (A) Establish whether the system of equations **(3)**

$10x + 8y + 9z + 6w = 33,$
$6x + 7y + 5z + 5w = 23,$
$8x + 10y + 7z + 7z = 32,$
$9x + 7y + 10z + 5w = 31,$

Is well-conditioned or not. Explain why?

(B) An approximate solution of equations, **(7)**

$x + 4y + z = 5$
$2x + 5y + 8z = 7$
$3x + 6y + 9.1z = 9.1,$

Is given by $x = 1.8, y = -1.2, z = 1$. Improve this solution by using the iterative method.

(C) Define the following terms: **(2)**
(i) inherent errors
(ii) Truncation errors.

Q:5 (A) Find all the roots of the equation $x^3 - 6x^2 + 10x - 6 = 0$, by Graeffe's method. **(6)**

(B) Evaluate the real root of the equation $x - \cos x = 0$, by using bisection method. **(5)**

OR

Q:5 (A) Consider the equation $3x = \cos x + 1$. By using the Newton-Raphson method, find real root of the equation, correct to four decimal places. **(6)**

(B) Explain the error propagation in various mathematical operations. **(5)**

Q:6 (A) Using the finite difference method, find y (0.25), y (0.5), y (0.75). Satisfying the differential equation $\frac{dy}{dx} + y = x$, subject to boundary condition $y(0) = 0, y(1) = 2$. **(6)**

(B) Using the shooting method, solve the boundary value problem **(6)**
$y''(x) = y(x), y(0) = 0$, and $y(1) = 1.17$.

END OF PAPER
Best of Luck