Exam No: _____

GANPAT UNIVERSITY
M. TECH SEM- 1ST (ELECTRICAL)
REGULAR EXAMINATION– NOV-DEC-2014
3EE101 : NUMERICAL TECHNIQUES

MAX. TIME: 3 HRS   **MAX. MARKS: 60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1 (A) Use the method of False Position to find a root of $f(x) = e^x - 2x^2$ with an accuracy of four digits.   **(05)**

(B) Determine the root of $f(x) = x\tan(x) + 1$ using Newton-Raphson method, correct upto three decimal places.   **(05)**

OR

Q.1 (A) Find a root of the equation $(\cos x)(\cosh x) - 1 = 0$ using the secant method with initial approximations: $x_0 = 4.5$ and $x_1 = 5.0$.   **(05)**

(B) Apply Graeffe's method to find all the roots of equation $x^4 - 3x + 1 = 0$.   **(05)**

Q.2 (A) An observation table of speed control of DC shunt motor is given as follow: **(05)**

Field Current (A)	0.48	0.54	0.6	0.66
Speed (rpm)	1738	1657	1569	1508

Calculate the required amount of field current to achieve speed of 1600 rpm.

(B) The voltage v across a capacitor at time t seconds is given by the following table :   **(05)**

t (sec.)	0	2	4	6	8
v (Volt)	150	63	28	12	5.6

Use the method of least square to fit a curve of the form of $v = ae^{kt}$ to this data.

OR

Q.2 (A) In an examination the number of students who obtained marks between certain limits was as follows: **(05)**

Marks	30–40	40–50	50–60	60–70	70–80
No. of students	18	40	64	50	28

Find the number of students whose scores lie between 70 and 75.

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

Voltage (V)	62	70	78	84	92
Resistance (R)	73	70.7	69.2	67.8	66.3

Assuming the law of the form R = a/V + b, find the best values of a and b using graphical method.

Q.3 Attempt the following questions.

(A) Derive the Newton's forward interpolation formula. (04)

(B) Define the term 'error'. Find the absolute error if the number X = 0.00486387 is (04)
   i) Truncated to four decimal digits.
   ii) Round off to four decimal digits.

(C) What do you mean by convergence? Give its significance. (02)

SECTION: II

Q.4 (A) The following data gives the velocity of a particle for 20 seconds at an interval of 5 seconds. (05)
Find the initial acceleration using the entire data.

Time t (sec)	0	5	10	15	20
Velocity v (m/sec)	0	3	14	69	228

(B) Compute the value of $\int_{0.2}^{1.4} (\sin x - \log x - e^x)\, dx$ using Simpson's $\frac{3}{8}$ th rule. (05)

OR

Q.4 (A) Find the value of $\cos(1.84)$ from following table. (05)

x	1.7	1.74	1.78	1.82	1.86
Sin x	0.9916	0.9857	0.9781	0.9691	0.9584

(B) Evaluate $\int_0^1 \frac{dx}{1+x^2}\, dx$ using trapezoidal rule taking $h = \frac{1}{4}$. (05)

Q.5 (A) Using Taylor's method, obtain the approximate value of y at $x = 0.2$, for the differential (05)
equation $\frac{dy}{dx} = 2y + 3e^x$, $y(0) = 0$.

(B) Apply Euler's method to approximate the solution of the initial value problem $\frac{dy}{dt} = -2\,ty^2$ (05)
with $y(0) = 1$ in the interval $0 \le t \le 0.5$, using $h = 0.1$.

OR

Q.5 (A) Use Runge-Kutta method of order two, to solve $y' = \sin y$ with $y(0) = 1$ from $x = 0$ to 0.2 in (05)
steps of $h = 0.1$. Keep four decimal places in the calculations.

(B) Solve the boundary value problem $y'' - 4y' + 4y = e^{3x}$ with conditions $y(0) = 0$, $y(1) = -1$, (05)
taking $n = 4$.

Q.6 Attempt any two. (10)

(A) Solve following equation by jacobi's method accurate to three decimal places:
$7x_1 + 52x_2 + 13x_3 = 104;$
$83x_1 + 11x_2 - 4x_3 = 95;$
$3x_1 + 8x_2 + 29x_3 = 71.$

(B) In a given electrical network, the equations for currents i_1, i_2, i_3 is
$3i_1 + i_2 + i_3 = 8;$ $2i_1 - 3i_2 - 2i_3 = -5;$ $7i_1 + 2i_2 - 5i_3 = 0;$
Calculate i_1, i_2 and i_3 by Gauss-Seidal method

(C) Solve following equation by Gauss elimination method, correct upto three decimal places :
$2x_1 + 4x_2 + x_3 = 3;$
$3x_1 + 2x_2 - 2x_3 = -2;$
$x_1 - x_2 + x_3 = 6.$

------------------------END OF PAPER------------------------