[Total No. of Questions: 12] **[Total No. of Printed Pages: 3]**

UNIVERSITY OF PUNE

[4362]-158

S. E. (Electrical) Examination - 2013

DIGITAL COMPUTIONAL TECHNIQUES (2008 Course)

[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

1 *Answer 3 questions from section-I and 3 questions from section-II.*
2 *Answers to the two sections should be written in separate answer-books.*
3 *Neat diagrams must be drawn wherever necessary.*
4 *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5 *Assume suitable data, if necessary.*

SECTION -I

Q.1 A) Find the quadratic factor of $x^4 - 1.1x^2 + 2.3x^2 + 0.5x + 3.3 = 0$ after two iterations using Lin-Baristow's method. Use $\mathcal{P}_0$ =1 and q_0 = 1 [10]

B) Explain round –off error and truncation error with suitable example [8]

OR

Q.2 A) Explain absolute error and relative error with suitable example. [6]

B) Using Birge-Vieta method find root of $\mathcal{X}^4 + \mathcal{X}^3 + 5\mathcal{X}^2 + 4x + 4 = 0$ at the end of two iterations with initial value $x_0 = 1$. [6]

C) Explain floating point algebra and normalised floating point algebra with suitable examples. [6]

Q. 3 A) Find the real root of $2x - 3\,sin\,x - 5 = 0$ correct to four decimal places with initial value $x_0 = 1$ using Newton Raphson's method. [8]

B) Explain false of position method for solution of transcendental equation. [8]

OR

Q. 4 A) Determine $\sqrt{29}$ using bisection method correct up to three decimal places. [8]

B) Explain Chebyshev's method to determine root of transcendental equation [8]

Q. 5 A) Explain Gauss elimination method for solution of linear simultaneous equation. [8]

B) Solve following system of equation using Gauss Seidal method [8]

$$10x - 2y + 3z = 23;$$
$$2x + 10y - 5z = -33;$$
$$3x - 4y + 10z = 41$$

OR

Q. 6 A) Solve following system of equation using Gauss Jordan method [8]

$$2x + y + 4z = 12;$$
$$8x - 3y + 2z = 23;$$
$$4x + 11y - z = 33$$

B) Explain Gauss Jacobi's method for solution of linear simultaneous equations. [8]

SECTION II

Q. 7 A) Explain least square method to fit the data into a straight line. $y = ax + b$. [8]

B) Find the interpolating polynomial using [10]

i) Lagrange's formula

ii) Newton's divided difference formula, for the following data and hence show that both the methods give raise to same polynomial

x	1	2	3	5
y	0	7	26	124

OR

Q. 8 A) Derive Lagrange's interpolation formula for unequally spaced data. [8]

B) For the following table of values, estimate $y(7.5)$ and $y(1.5)$ using appropriate interpolation formula [10]

x	1	2	3	4	5	6	7	8
y	1	8	27	64	125	216	343	512

Q. 9 A) Explain Taylor's series method for solution of ordinary differential equation [8]

B) Compute $y(0.3)$ with $h = 0.1$ from $\frac{dy}{dx} = y - \frac{2x}{y}$, [8] y (0) = 1 by modified Euler's method.

OR

Q. 10 A) Given $\frac{dy}{dx} = \frac{1}{x+y}$ y (0) = 2. [8]
$If\ y\ (0.2)\ =\ 2.09, y(0.4)\ = 2.17, y(0.6)\ =\ 2.24$, find $y(0.8)$ and $y(1.0)$ using Mile's method.

B) Explain modified Euler's method for solution of ordinary differential equation. [8]

Q.11 A) Derive formula of Simpson's $\left(\frac{1}{3}\right)^{rd}$ Rule as a special case of Netwon Cote's formula for numerical integration. [6]

B) Evaluate $\int_0^{0.9} log_e\ (1 + \sqrt{x})\ dx$ using trapezoidal rule of integration with 9 sub-intervals. [5]

C) Evaluate $\int_0^{\frac{\pi}{2}} e^{\sin\ x}\ dx,$ using Simpon's $\left(\frac{3}{8}\right)^{th}$ rule [5] With 6 sub-intervals.

OR

Q. 12 A) Derive formula of Trapezoidal Rule as a special case of Newton Cote's formula for numerical integration. [6]

B) Derive formula for $\frac{dy}{dx}\ and\ \frac{d^2y}{dx^2}$ at $x\ =\ x_n$ using Newton backward interpolation formula. [5]

C) Evaluate $\int_{1.0}^{1.8} \frac{e^x + e^{-x}}{2}.\ dx$ using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule by taking $h\ =\ 0.2$ [5]