PARUL UNIVERSITY
FACULTY OF APPLIED SCIENCE
M.Sc. Winter 2019-20 Examination

Semester: 3   Date: 28/11/2019
Subject Code: 11204202   Time: 02:00 pm to 04:30 pm
Subject Name: Numerical Methods and Analog Electronics   Total Marks: 60

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1. A) Attempt any <u>one</u> of the following.   **(08)**
    (a) Use Euler's method to solve $dy/dx = x + y$, $y(0) = 1$; Compute y(0.1), y(0.2), y(0.3) and y(0.4).
    (b) $dy/dx = y - x$, where y (0) = 2, find y (0.1) and y (0.2), using RK-4 formula

Q.1. B) Attempt any <u>two</u> of the following.
    (a) Do as directed.   **(04)**
        1. Explain Picard's method in brief.
        2. Give k1,k2,k3 and k4 in RK-4 method.
    (b) $y' = x - y$, $y(0)=1$, find $y(0.1)$ using modified Euler's method.   **(04)**
    (c) Explain Gauss-Seidel method to solve Laplace's equation, with suitable example.   **(04)**

Q.2. A) Do as directed.
    (a) Attempt any **one**.   **(04)**
        1. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$; subject to the initial condition $u = sin \ x$ at $t = 0$ for $0 \ x \ 1$ and $u = 0$ at
           x = 0 and $x = 1$ for $t > 0$, by Gauss- Seidel method.
        2. From the Taylor series for $y(x)$, find $y(0.1)$ correct to four decimal places if $y(x)$ satisfies
           $y' = x + y$ and $y (0)=1$.
    (b) Use Picard's method to solve the equation $y' = 1/x + y$ subject to $y(0)=1$.   **(04)**

Q.2. B) Do as directed. (Any two)
    (a) Answer the following in short.   **(03)**
        1. Name the simplest predictor-corrector method.
        2. Why do we need modified Euler's method?
        3. In _____ method, we approximate the curve of solution by the tangent in
           each interval. (Picard's/ Euler's)
    (b) Give the formula for (i) Jacobi's method (ii) Gauss-Seidel method to solve Laplace and   **(03)**
        Poisson's equations.
    (c) $y' = x - 2y$, $y(0)=1$, find $y(0.1)$ using RK-4 method.   **(03)**

Q.3. A) Attempt any one.   **(08)**
    (a) Draw the root locus for the system $G(s) = 4K/\{(s-1)(s-2)(s-3)\}$; $H(s)=1$.
    (b) Explain: (i) basic operation of PLL. (ii) PLL as demodulator.

Q.3. B) Answer the following questions (Any two)
    (a) Do as directed   **(04)**
        1. Draw the circuit for current booster.
        2. Draw the circuit for positive high voltage IC regulator.
    (b) Draw pole-zero diagram for the system $G(s) = 4s/\{(s-1)(s-2)(s-3)\}$ **(04)**
    (c) Draw the functional block diagram of IC 723 voltage regulator and explain its working as a   **(04)**
        basic low voltage regulator.

Q.4. A) Answer the following questions.
    (a) Do as directed.   **(04)**
        1. Define: (i) -3 dB frequency (ii) roll-off rate
        2. Draw the circuit for first order low-pass Butterworth filter.
    (b) Explain the circuit and frequency response for a wide band reject filter.   **(04)**

Q.4. B) Answer the following questions (Any two)
    (a) Short questions   **(03)**
        1. Define rise time.
        2. Write any one application for sample-hold circuit.
        3. Give the full form of PLL.
    (b) Short note: Logarithmic amplifiers.   **(03)**
    (c) Short note: comparators.   **(03)**