

EE/EL-207 Engineering Analysis and Design

Time : 3 hours

Max. Marks: 40

Note: Answer any five questions. Assume suitable missing data, if any. Symbols used have their usual meanings

Q1. Answer the following questions briefly

- a) Develop a MATLAB program to compute sum of series 1,3,5, .... upto 100 terms. Also compute the mean and the mean deviation in the code.
- b) Create a function to convert temperature in Kelvin to Fahrenheit. Call the function and get user input and print output also. (2x4=8)

Q2.

- a) Use Euler method to solve  $y' = x+y$ ,  $h=0.2$ ,  $y(0)=0$ ; compute  $y$  at  $x=0.8$ .
- b) Develop a program to compute impedance and power factor using user inputs such as frequency, resistance, inductance and capacitance value for a series RLC circuit. (2x4=8)

Q3.

- a) Using RK4 technique. show the solution for the differential equation:  $dy/dx=(x+y)\sin(xy)$ ,  $y(0)=5$  after the first iteration, taking  $h=0.2$
- b) Show how differential equations can be solved using RK2, RK4; clearly highlight the difference in their accuracy and mathematical complexity. (2x4=8)

Q4.

- a) What is Trapezoidal rule. Use it to calculate integral of  $f(x)=\sin(x)$  between the limits 0 and  $\pi$  taking 12 steps. Also compute the error between the estimated value and the actual value and interpret your results.
- b) Solve using Newton Raphson method to compute the root of the function  $f(x)=e^{-x} - x$  given initial guess  $=0$ ,  $x_0=0$ . (2x4=8)

Q5.

- a) Solve the system of equations given below using a suitable method:  
 $x_1^2 + x_1x_2=10$  and  $x_2 + 3x_1x_2^2=57$  Assume initial guess is (1,2)
- b) Develop a Simulink model to represent the differential equation  $79v'' - 9v' + 0.4v + 3.14=0$ . Assume  $v, v'$  are outputs to be observed, (2x4=8)

Q6.

- a) Find transfer function for computing the voltage across a capacitor for a series RLC circuit, when the input is (i) constant voltage (ii) a sine wave.
- b) Discuss the analogy between mechanical and electrical systems giving suitable examples. (2x4=8)