Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (Regular), DECEMBER 2022

(2020 SCHEME)

Course Code : 20EET391

Course Name: Digital Simulation

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

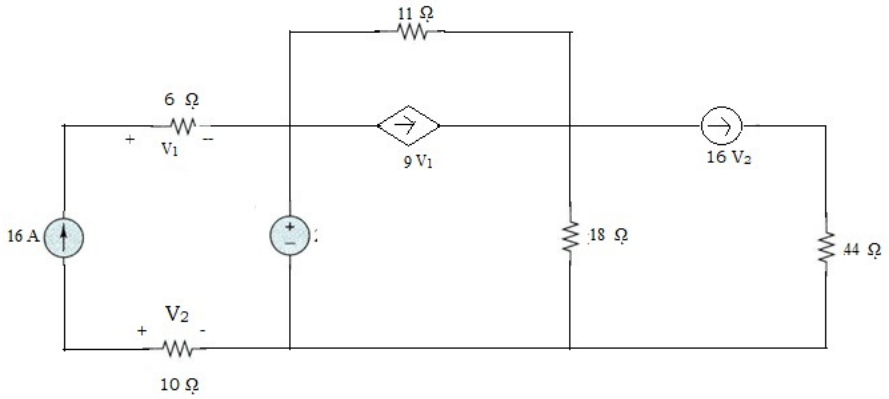
1. Differentiate between DC simulation and transient simulation.
2. Describe the need for Modified Nodal Analysis (MNA) in simulation of electric circuits.
3. Describe the method for simulation of electric circuits using backward Euler method.
4. Differentiate between local truncation error and global error.
5. Describe the stiff system with the help of an example.
6. Discuss the relevance of adaptive step size in circuit simulation
7. Describe the functions of various dot commands in SPICE circuit simulation.
8. Explain the function of '.SUBCKT' in PSpice programs.
9. Explain break-return control structures in MATLAB programs.
10. Differentiate the applicability of ode23 and ode23t solvers in MATLAB simulation.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Obtain the modified nodal matrix to solve the circuit parameters in the following circuit.



(10)

b) Explain noise analysis in electric systems with the help of an example. (4)

OR

12. a) Describe the general steps to formulate the admittance matrix using nodal analysis in an electric circuit with the help of an example. (7)

b) Describe the relevance and method of sensitivity analysis in electric circuit simulation with the help of an example. (7)

MODULE II

13. a) Explain the forward Euler's method for solution of ordinary differential equations with the help of necessary equations (10)

b) Justify the need for discretization of time in transient simulations. (4)

OR

14. a) Describe the sources of errors in numerical methods (7)

b) Differentiate between explicit and implicit methods (7)

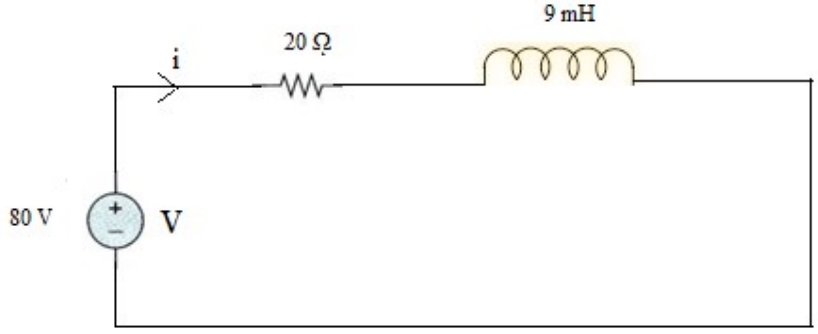
MODULE III

15. a) Explain the backward Euler method for solution of ordinary differential equations and its application for solving an electric circuit with the help of an example. (8)

b) Describe the methodologies used for adaptive step size simulation (6)

OR`

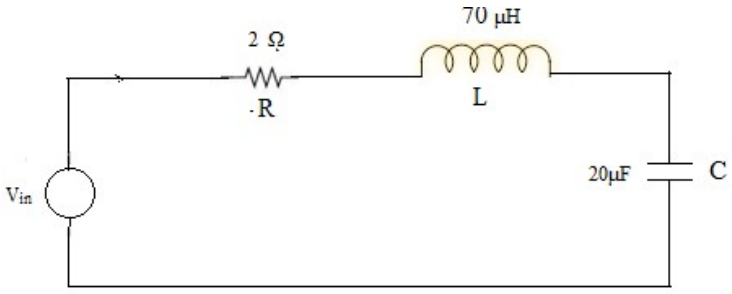
16. Find the current through the inductor at t=0.6 sec in the following circuit by using Euler's method with 5 iterations.
Voltage across inductor is $V_L(t)$ =(0.9V - $0.2i_L Re^{-6t}$)10^{-3}V.
Current through the inductor, $i_L = 1.8\ A\ at\ t = 0.1sec$.

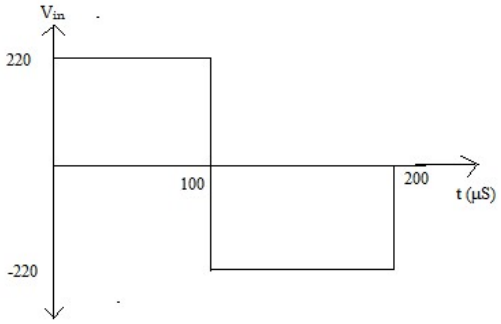


(14)

MODULE IV

17. A series RLC circuit and the input voltage V_{in} are given below. Write a PSpice program to calculate and plot the transient response from 0 to 600 µS with a time increment of 2 µS. Plot the voltage across the capacitor and the current through the resistor. (14)



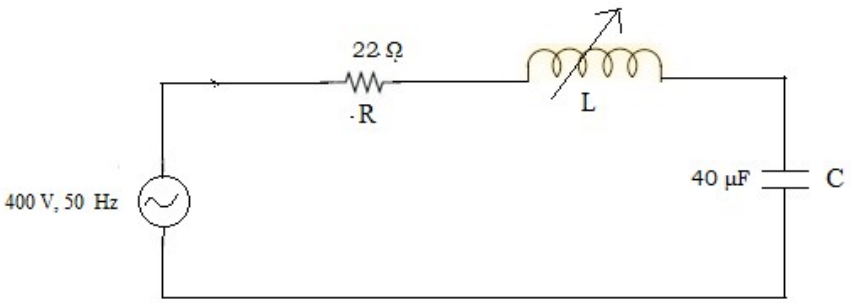


OR

18. Draw the equivalent circuit of a bipolar junction transistor (BJT). Write the sub circuit call and sub circuit description. Assume suitable values for the circuit parameters. (14)

MODULE V

19. Write a MATLAB program to determine the value of inductance, L which should be adjusted to obtain the resonance condition by measuring the voltage across all the circuit elements during simulation. (14)



OR

20. Describe any three types of control structures in MATLAB with the help of examples. (14)

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