APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY

08 PALAKKAD CLUSTER
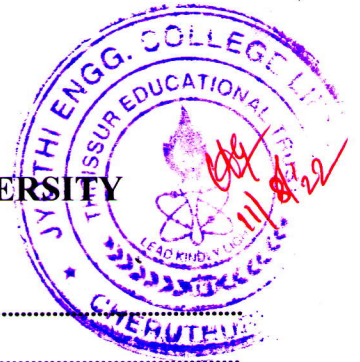
Q. P. Code: **PE0822242C-I**   (Pages: 2)

Name: ....

Reg. No: ....

SECOND SEMESTER M.TECH. DEGREE EXAMINATION JULY 2022

Branch: Electrical & Electronics Engineering   **Specialization: Power Electronics**

08EE6242(C) Digital Simulation of Power Electronics System

Time: 3 hours   Max. Marks: 60
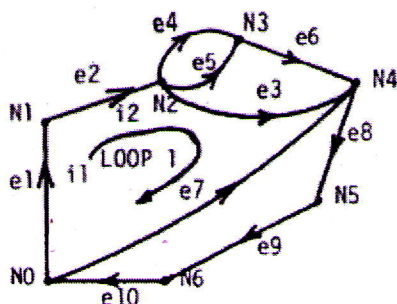
Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q. No.	Module 1	Marks
1.a	Role of macro modelling and micro modelling in power semiconductor environment: Comment on the topic with application	3

Answer b or c

b	Calculate the element values of a thyristor model. The device has a nominal voltage rating of 2000V and an RMS current rating of 80A. The device turn on time is 1µs. During a turn OFF test on the thyristor, the applied inverse voltage is 1642V and the measured maximum reverse current is 14.2A. The turn OFF time is estimated to be 20 µs under the test conditions. The forward leakage current is estimated to be 100mA when the voltage is 1000V.	6
c	Explain AC machine modelling with induction motor as an example.	6

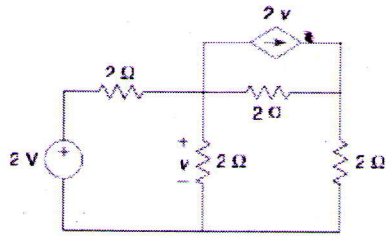| Q. No.	Module 2	Marks
2.a	Write the incidence matrix for the transistor chopper circuit shown below. Make suitable assumptions wherever necessary	3
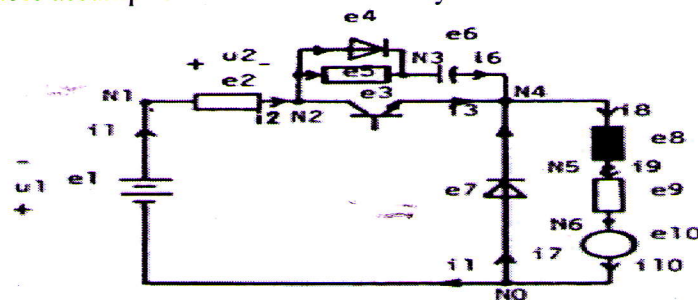
Answer b or c

b	Write an algorithm for formulation of a proper tree for the given example	6

N1, N2, ... ,N6: NODES OR VERTICES

e1, e2, ... ,e10: EDGES

c   Use fundamental cut-set matrix method for finding the voltage V.

Q. No.	Module 3	Marks
3.a	Discuss the concept of state space averaging and circuit averaging with its application?	3

Answer b or c

b	Derive small signal model for buck converter using state space averaging in continuous conduction mode?	6
c	Derive the averaged switch model for SEPIC converter in continuous conduction mode using circuit averaging technique.	6

Q. No.	Module 4	Marks
4.a	Discuss the multi run analysis and statistical analysis in ORCAD PSPICE	3

Answer b or c

b	Give the step by step method to simulate buck converter using PSPICE and to find its response to a step input of V volts	6
c	Explain the analog behaviour modelling in PSPICE for a single phase half wave diode bridge rectifier	6

Q. No.	Module 5	Marks
5.a	1.Highlight the importance of exact modelling of systems in simulation environment (3) 2.Name any four different tools which can be used for simulation purposes (1)	4

Answer b or c

b	Derive small signal model for boost converter?	8
c	Derive state space model for the given RLC circuit and hence derive its transfer function? What are its merits over conventional modelling methods?	8

Q. No.	Module 6	Marks
6.a	Define MATLAB Simulink tool and its role on performance analysis of systems. Name the various tools available in MATLAB Simulink environment	4

Answer b or c

b	Code a program in MATLAB to simulate three phase controlled three phase half wave inverter with 60 degree blanking interval	8
c	Code a MATLAB program with the help of flowchart to simulate full bridge inverter with 30 degree blanking interval.	8