2nd Semester M.Tech. Electrical (PECD)

DIGITAL SIMULATION OF POWER ELECTRONICS & SYSTEMS

Full Marks: 70

Time: 3 hours

Question No. 1 is compulsory. Answer any *five* from the rest.

The figures in the right hand margin indicate marks. *Symbols carry usual meaning.*

Q1. Answer all questions. [2×10]

a) List linear elements and non-linear elements used in computerized analysis of power electronics circuits.

b) Describe switching characteristics of thyristor (current ~ voltage) in four quadrants.

c) Discuss two transistor model of thyristor.

d) What is state space equation; give example circuit and its state space model.

e) A circuit under analysis has an open circuit while writing netlist in PSPICE, how this will be handled, describe.

f) What is command for Fourier analysis in PSPICE A/D.

g) Differentiate PSPICE and PSPICE A/D.

h) Describe PLOT and PRINT command in PSPICE A/D.

i) What is Saber? How it is used to analyze power electronics circuit.

j) How PSPICE schematic is better than PSPICE A/D? Discuss.

Q2. a) Model an induction motor and drive state space equations. [7]

b) Take an example of power electronics small circuit and describe how KCL, KVL analysis is done using graph theory. [3]

Q3. a) Calculate model parameters thyristor having the following static characteristics:

$V_{FOM} = V_{ROM} = 600V$; $I_F = 25$ A; $V_{FD} = 1.5V$ at 25 A ; leakage current (forward and reverse) is 1 mA at an anode to cathode voltage of 200V and it can assumed to be proportional to the thyristor voltage. Forward Voltage drop at very low anode current is 1V. [7]

b) Derive two transistor model of thyristor. [3]

Q4. a) Describe how AC sweep, DC sweep and transient analysis is done using PSPICE A/D. [5]

b) Write a PSPICE A/D program for subcircuit. [5]

Q5. a) Describe different files in PSPICE A/D simulator. [5]

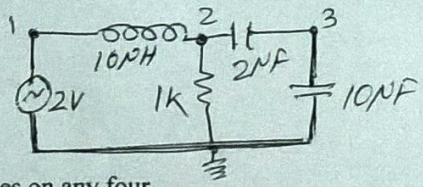
b) Give overview how PSPICE schematics work. [5]

Q6. a) What are the different types of ERROR and WARNINGS in Saber? [5]

b) Describe typical design process using Saber. [5]

Q7. a) What is Fourier analysis? How it is done in PSPICE schematics and Saber. [5]

b) Write NELIST commands using PSPICE A/D. [5]



Q8. Write short notes on any four. [5+5]

a) DC machine modeling

b) Example of use of probe command

c) Orcad PSPICE