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MEPE - 302(A)

M.E./M.Tech. III Semester

Examination, June 2016

Computer Aided Power Electronics Analysis and Design (Elective-II)

Time : Three Hours

Maximum Marks : 70

Note: Attempt any five questions. All questions carry equal marks

1. a) Discuss algorithms for the systemic formulation of the state equations using digital computer.

   b) The equivalent circuit for a rectifier system is shown in figure 1. The diode is modeled as a binary resistance R_D having following values.
   $R_D = 0.1\Omega$ when the diode is in the conducting state.
   $R_D = 10^6\Omega$ when the diode is in blocked state.
   Compute numerically the solution of the state equation for the rectifier system by using the Euler forward algorithm.

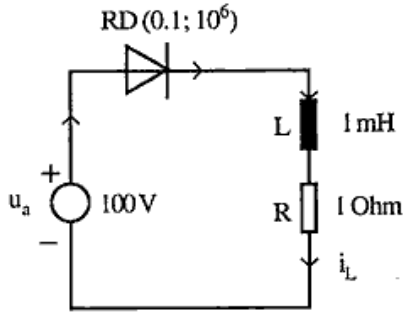

Figure 1 Equivalent circuit for a rectifier system.

2. a) Discuss briefly the methods used for the solution of state equations.
   b) Explain Euler forward algorithm with an example.

3. Consider a single phase single-pulse thyristor rectifier circuit shown in fig 2.5. The thyristor is modeled as a hig-impedance r_{off} L_{off} circuit while in the blocked state; it is modeled as a low resistance circuit while conducting and is then equal to 0.02Ω. The leakage inductance L_s of the supply transformer is equal to 1mH. Calculate the modeling impedance of the thyristor while in the blocked state; assume that the thyristor forward of reverse leakage current is equal to 1mA at an anode-cathode voltage of 200V.

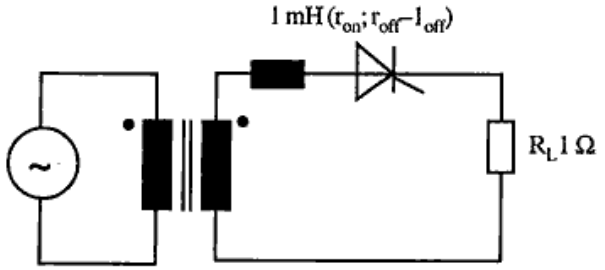

Figure 2.5 Single-phase single-pulse thyristor rectifier.

4. Discuss in brief the topological methods of analysis of electric circuits containing R,L,C and semiconductor switches.

5. a) Discuss the methods of formulation of system equations for power electronic converters.
   b) Give the details pertaining to the general purpose simulation program named ATOSEC5.

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6. a) Explain the modeling aspects of control circuits for powe electronic devices.
   b) What is micromodel of thyristor? Explain in brief wit suitable example.

7. a) Briefly discuss the numerical instability probler associated with a system described by widely varying tim constants.
   b) Calculate the thyristor modeling inductance value for typical medium-capacity high-voltage thyristor whos data are as follows:
   $V_{FOM} = 2000V$ $I_F = 80A$ $t_{on} = 1\mu s$

8. a) Calculate the model parameter for a thyristor having th following static characteristics: $V_{FOM} = 500V$; $I_F = 20A$ $V_{FD} = 1.5V$ at 20A. The leakage current (forward o reverse) is 2mA at an anode to cathode voltage (thyristo voltage) of 210V and it can be assumed to be proportiona to the thyristor voltage. The forward voltage drop at ver low anode current can be assumed to be nearly constan and is equal to 1.5V.
   b) Differentiate between SACSOTR and ATOSEC programs

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