D 10039 (Pages : 4) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2010

EE09 303/PTEE 09 302—ELECTRIC CIRCUIT THEORY

(2009 admissions)

Time : Three Hours Maximum : 70 Marks

Part A

(Answer all questions: 5 x 2 marks = 10 marks)

1. For the circuit shown in figure (1), find the power delivered by 1A source.

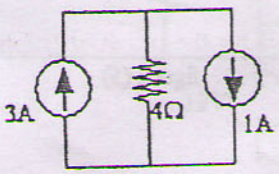

figure (1)

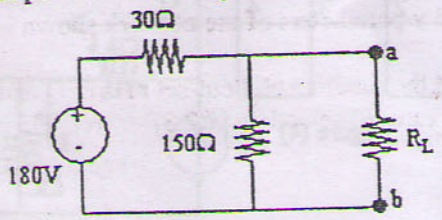

figure (2)

2. Find the load resistance R_L that will result in maximum power delivered to the load circuit shown in figure (2).
3. Use final-value theorem to find $f(\infty)$ if $F(s)=\frac{(s+2)}{s(s+3)(s+4)}$.
4. A resistive T network has 3Ω resistances in each series arm and 4Ω resistance in shunt arm. Find Z-parameters.
5. An admittance function is given by $Y(s)=\frac{s}{s+1}$. Realize the RC network.

PART B

(Answer any four questions: 4 x 5 marks = 20 marks)

6. Find I_b using mesh analysis for the circuit shown in figure (3).

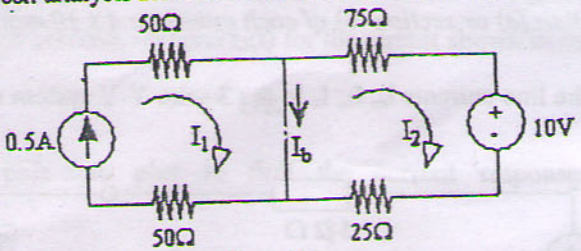

figure (3)

7. The three phase voltages of a 3-phase system are $V_a=230\angle 0°V$; $V_b=210\angle -110°V$ and $V_c=190\angle 110°V$. Determine the sequence components V_{a1}, V_{a2} and V_{a0}.
8. By using convolution theorem, determine the inverse Laplace transform of $F(s)=\frac{1}{s^2(s+1)}$.

Turn over

9. Find the Laplace transform of square wave shown in figure (4).

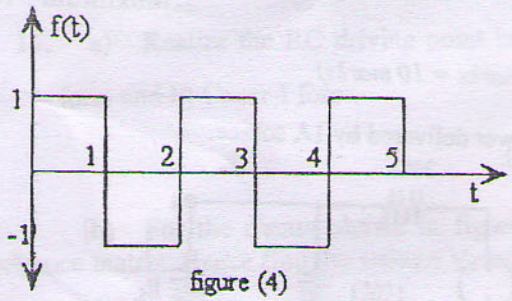

figure (4)

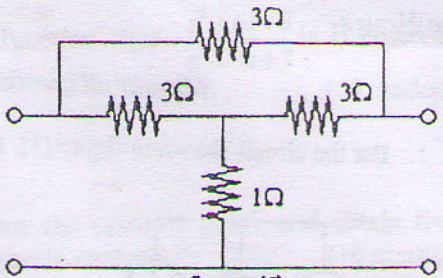

figure (5)

10. Find y-parameters of the network shown in figure (5).

11. Find the fundamental cut-set matrix Q and tie-set matrix B for the oriented graph shown in figure (6) selecting {1,2,3} as tree. Hence, prove that $QB^T=0$.

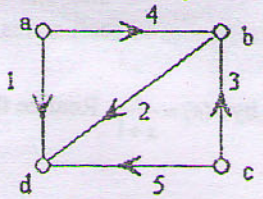

figure (6)

PART C

(Answer section (a) or section (b) of each question: 4 x 10 marks = 40 marks)

12. (a) i) Calculate the line currents I_a, I_b, I_c in the 3-wire Y-Y system shown in figure (7). (5 marks)

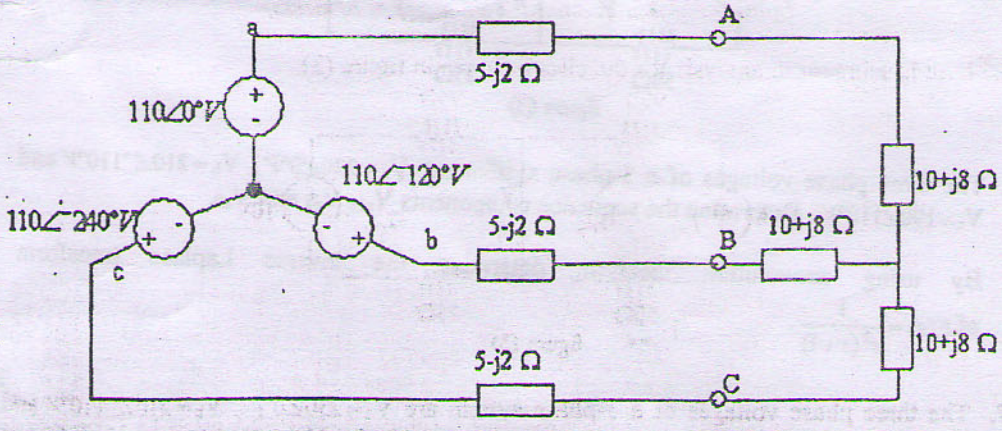

figure (7)

ii) A coil having a 2Ω resistance is connected in series with a 50μF capacitor. The circuit resonates at 100Hz. What is the inductance of the coil? If the circuit is connected across a 100V, 100Hz ac source, find the power dissipated in the coil. (5 marks)

OR

(b) Use Superposition theorem to find current I in the circuit shown in figure (8). (10 marks)

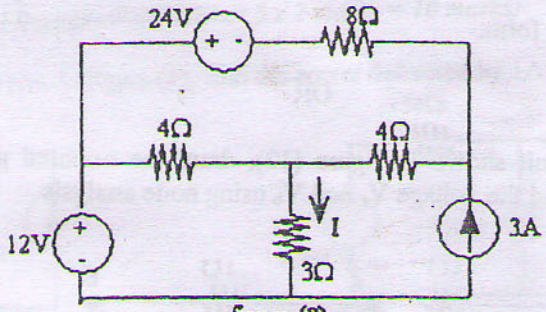

figure (8)

13. a) i) For the circuit shown in figure (9) , determine the current through the 2Ω resistance when the switch is moved from position 1 to position to 2 at t=0. The switch has been in position 1 for a long time to get steady state values. (5 marks)

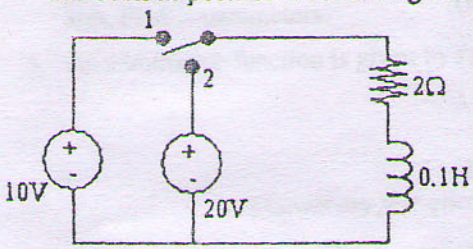

figure (9)

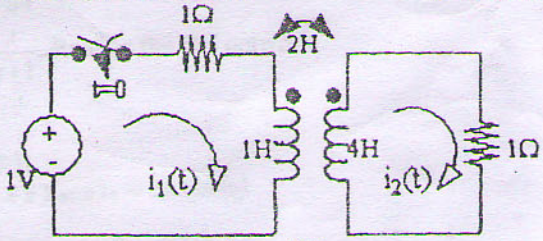

figure (10)

ii) Find the currents $i_1(t)$ and $i_2(t)$ for the circuit shown in figure (10). (5 marks)

OR

b) i) Use pole-zero plot to find the current response in time-domain if $I(s)=\frac{4s}{(s+2)(s+5)}$. (5 marks)

ii) Find the driving point impedance of the network shown in figure (11). (5 marks)

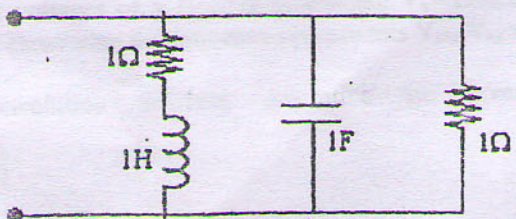

figure (11)

14. a) i) Find the open circuit and short circuit parameters of a T-network with resistance in each arm equal to 3Ω and hence find the image impedances. (5 marks)

ii) Derive the condition for reciprocity of a two-port network in terms of Z-parameters. (5 marks)

OR

b) Design T and π networks of m-derived high pass filter having nominal characteristic impedance $R_0 = 900\Omega$, cut-off frequency $f_c = 2kHz$ and infinite attenuation frequency $f_\alpha = 1.8kHz$. (10 marks)

15. a) Realize the RC driving point impedance function $Z(s) = \frac{s^2+6s+8}{s^2+4s+3}$ in i) Foster-I form and ii) Cauer-I form. (10 marks)

OR

(b) For the circuit shown in figure (12), draw the oriented graph and obtain the incidence matrix. Hence find the voltage V_a and V_b using node analysis. (10 marks)

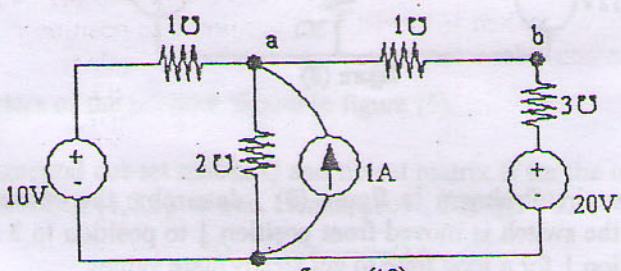

figure (12)