D 42023 (Pages : 4) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2007

EE 04 306—ELECTRIC CIRCUIT THEORY

(2004 Admissions)

Time : Three Hours Maximum : 100 marks

Answer all questions

I a Three star connected impedances, $Z_1 = 15 + j25\ \Omega$ per phase, are connected in parallel with three-delta connected impedances, $Z_2 = 20 - j30\ \Omega$ per phase. The line voltage is 440 V. Find the line current, the power factor, the active power and the reactive power taken by the combination.

b A balanced Δ-connected load having an impedance $20 - j15\ \Omega$ is connected to a Δ-connected, positive sequence generator having $V_{AB} = 330\angle 0^0$ V. Calculate the phase currents of the load and the line currents.

c Find by convolution integral, the Laplace inverse of $\frac{1}{(s+1)(s+2)}$, taking $\frac{1}{s+1}$ as the first function and $\frac{1}{(s+2)}$ as the second function.

d Determine the condition under which the input impedance of the network shown in Fig. 1 will be equal to R.

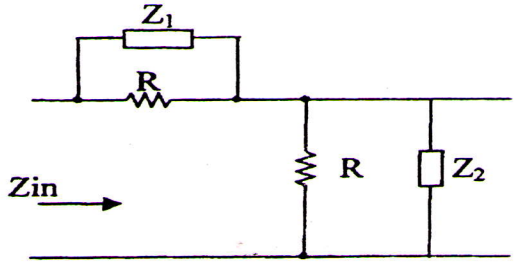


Fig. 1

e Calculate the resistance of each resistor of a two port network having exactly three resistor that will have the following h parameters.

$h_{11} = 22\ \Omega$, $h_{12} = 0.2$ and $h_{22} = 12 \times 10^{-3}$ mho

f Calculate the image parameters for the network shown in Fig. 2.

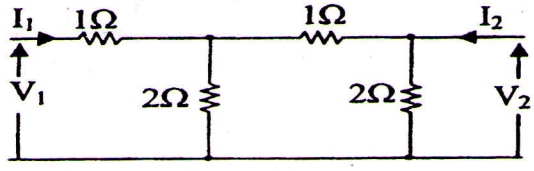


Fig. 2

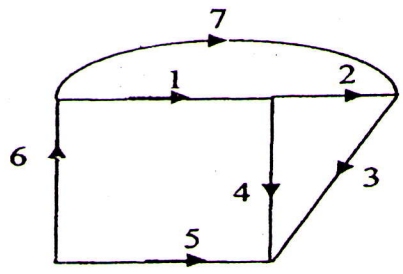


Fig. 3

g Using Foster Form II, synthesize the function

$$Y(s) = \frac{(s^2+5)(s^2+13)}{s(s^2+9)}$$

h Find the fundamental cut-sets of the graph shown in Fig. 3. (8 × 5 = 40 marks)

II(a) Two wattmeters A and B give readings as 5000 W and 1000 W respectively of the power measurement in a three-phase, three-wire balanced load system.

a) Calculate the power and power factor

i. when both meters read direct, and

ii. when the second meter reads in reverse.

The voltage of the circuit is 400 V.

b) What is the value of the capacitance which must be introduced in each phase so that the whole of the power will appear on wattmeter A? The frequency of supply is 50 Hz.

(OR)

(b) Calculate the line currents in the three wire Y-Y system of Fig. 4.

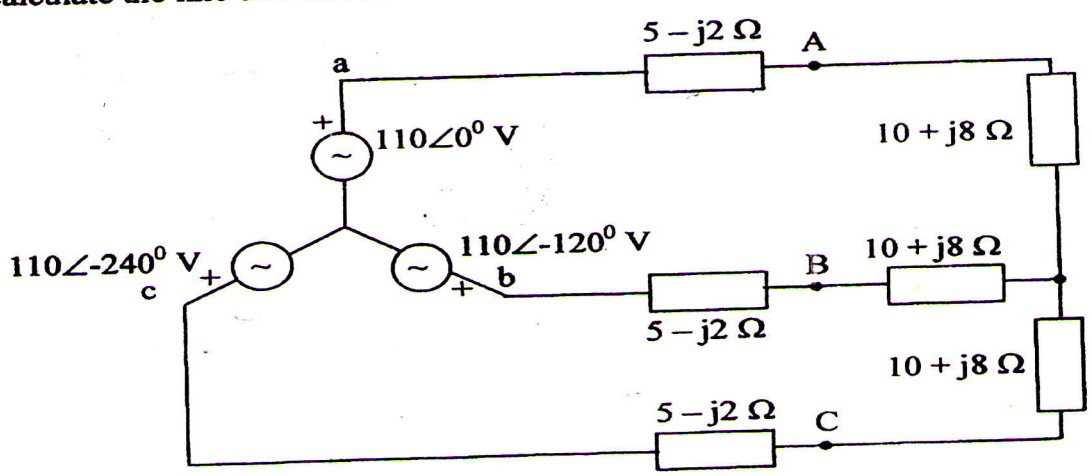


Fig. 4

III(a) i Obtain the inverse Laplace transform of $F(s) = \frac{1}{s^2(s+2)}$ by convolution integral and compare the result by finding the inverse transform of F(s). 7

ii Determine f(t) if $F(s) = \frac{s+3}{s(s+1)(s+2)}$. What is the value of f(t) at t = 0 and $t = \infty$? 8

(OR)

(b) Determine $\frac{V_2(s)}{V_1(s)}$ and $\frac{V_2(s)}{I_1(s)}$ of the network shown in Fig. 5.

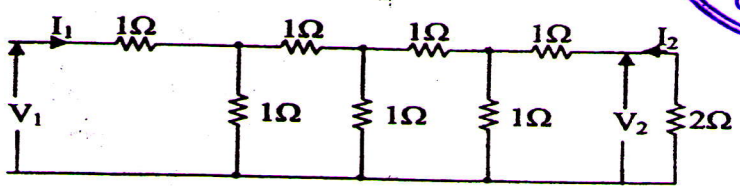


Fig. 5

IV(a) The pole-zero pattern for driving point impedance of a network and the given network are shown in Fig. 6. Determine

i. an expression for Z(s) and

ii. find the parameters R, L, G and C as functions of a, b, and c if Z(0) = 1.

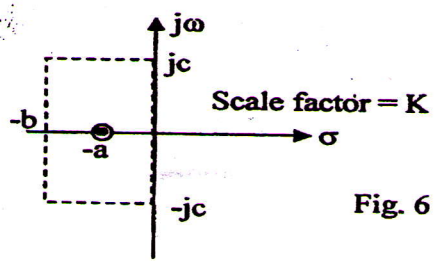
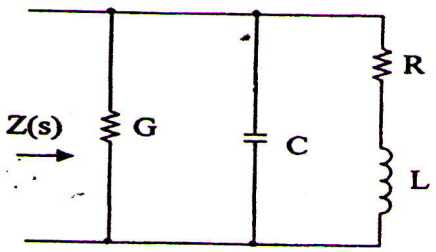


Fig. 6



(OR)

(b) Design a m-derived low-pass filter if it has designed resistance $R_0 = 600\ \Omega$, cut-off frequency = 1600 Hz and infinite attenuation frequency $f_\infty = 2200$ Hz.

V(a) Synthesize the C impedance function

$$Z(s) = \frac{s(s^2+4)(s^2+6)}{(s^2+3)(s^2+5)}$$

by using Cauer Form II.

(OR)

(b) i Obtain the incidence matrix for the graph shown in Fig. 7.

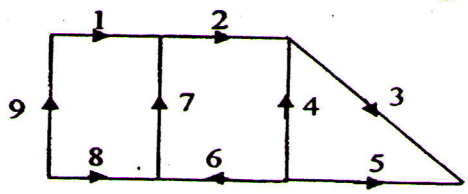


Fig. 7

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ii Find the currents in the 5Ω, 2Ω, and 1Ω resistors in the circuit shown in

Fig. 8, using the node voltage technique.

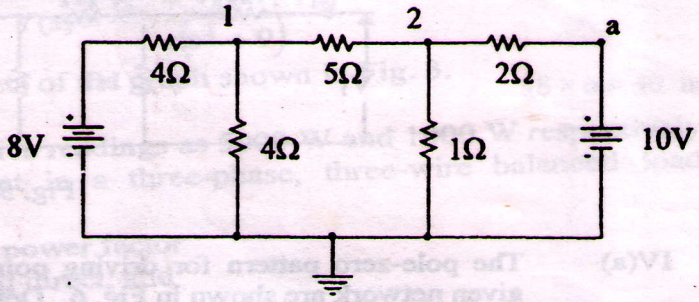

Fig. 8

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[4 × 15 = 60 marks]