D 32970 (Pages : 3) Name.....

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THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2012

Electrical and Electronics Engineering

EE 04 306—ELECTRIC CIRCUIT THEORY

(2004 Scheme)

Time : Three Hours Maximum : 100 Marks

Part A

I. 1 A three-phase delta connected load has $Z_{ab} = (100 + j0)\,\Omega, Z_{bc} = (-j100)\,\Omega$ and $Z_{ca} = (70.7 = j70.7)\,\Omega$ are connected to a balanced 3-phase 400 V supply. Determine the line currents I_a, I_b and I_c. Assume the phase sequence *abc*.

2 A three-phase three-wire 300 V ACB system feeds the unbalanced Y-connected load shown in Fig. 1 Find the line currents and the phase voltages of the load. Also determine the displacement neutral voltage V_{ON}.

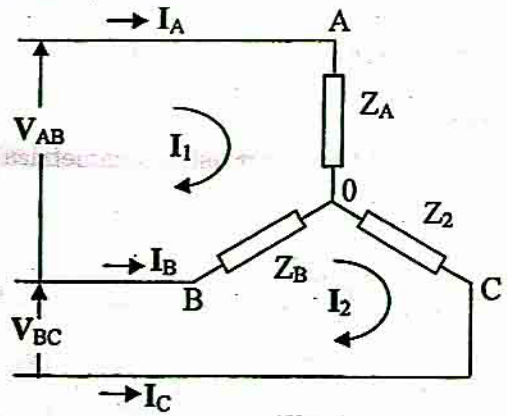

Fig. 1

3 Find the Laplace inverse of $\frac{1}{s(s+4)}$ using convolution integral.

4 Realize the following reactance function in four canonic forms

$$\frac{(s^2+1)(s^2+6.25)(s^2+25)}{s(s^2+4.5)(s^2+9)}.$$

5 Determine the transmission parameter A of the network in Fig. 2.

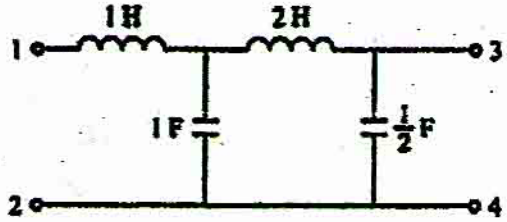

Fig. 2

Turn over

6 If a T section of a constant k low pass filter has series inductance 85 mH and shunt capacitance 0.025 μF, calculate its cut-off frequency and the nominal design impedance R_0.

7 Check whether the polynomial $s^4+s^3+7s^2+4s+6$ is Hurwitz or not.

8 Draw the oriented graph of the network in Fig. 3 and write the incidence matrix.

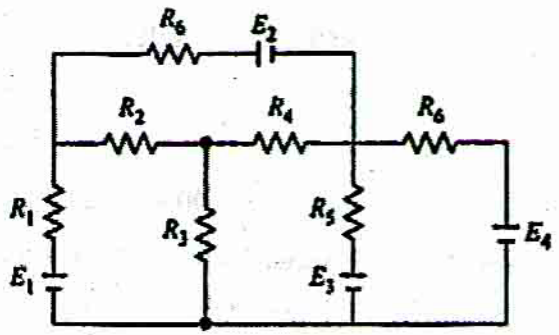

Fig. 3

(8 × 5 = 40 marks)

Part B

II. (a) Consider the circuit in Fig. 4. If $V_{an} = 100\angle 0°$ V, $V_{bn} = 60\angle 60°$ V, $V_{cn} = 60\angle 120°$ V, $X_s = 12\,\Omega$, and $X_{ab} = X_{bc} = X_{ca} = 5\,\Omega$

(i) Calculate I_s, I_b, and I_c without using symmetrical components.

(ii) Calculate I_a, I_b, and I_c using symmetrical components.

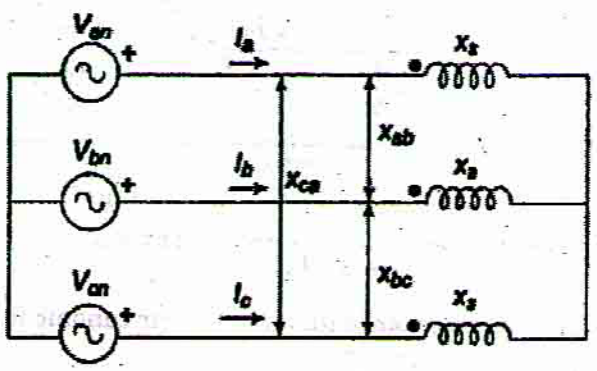

Fig. 4

Or

(b) Find I_1 and I_2 in the circuit of Fig. 5. Calculate the power absorbed by the 4-Ω resistor.

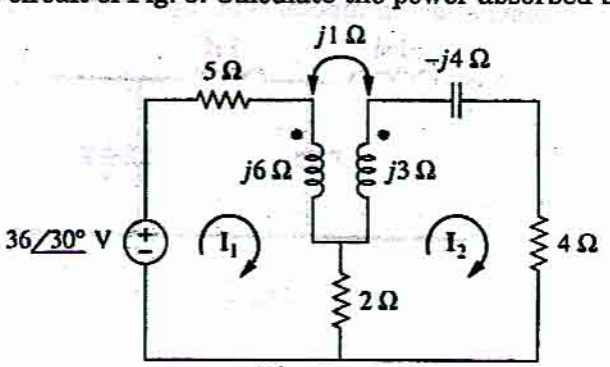

Fig. 5

III. (a) If V_C (0) 2V with the polarities in Fig. 6, write a suitable differential equation and using Laplace transform, find $V_C(t)$

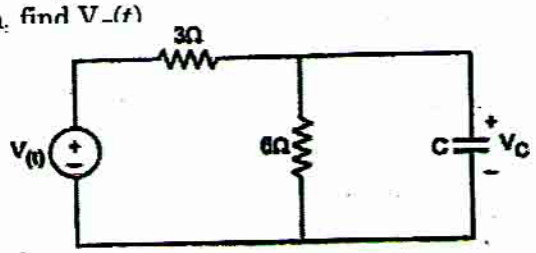

Fig. 6

Or

(b) For the network function $V(s) = \frac{5(s+5)}{(s+2)(s+7)}$, draw pole-zero plot and hence obtain time domain response of voltage.

IV. (a) The z parameters of a two port network are $z_{11} = 20\ \Omega$, $z_{22} = 30\ \Omega$, $z_{12} = z_{21} = 10\ \Omega$. Find the y and ABCD parameters of the network.

Or

(b) Design a T-section and a π section constant k high pass filter having cut-off frequency of 14 kHz and nominal impedance of $R_0 = 600\ \Omega$. Also determine (i) its characteristic impedance and phase constant at 26 kHz, and (ii) attenuation at 6 kHz.

V. (a) Find the Foster Form I and Cauer Form I of the impedance function $Z(s) = \frac{(s+4)(s+6)}{(s+3)(s+5)}$, if possible.

Or

(b) For the circuit in Fig. 7, obtain $\frac{V_2}{V_s}$. If $V_s = \cos \omega t$, determine $\omega = \omega_x$ for which the output is real.

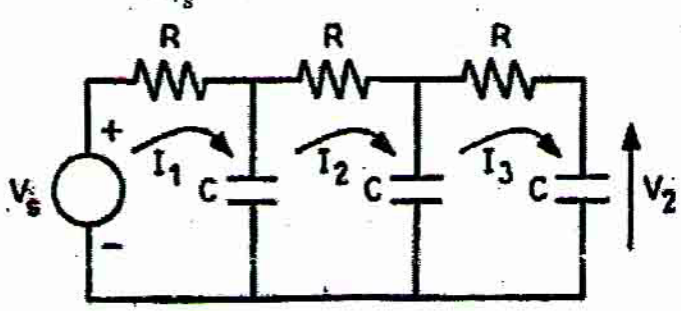

Fig. 7

(4 × 15 = 60 marks)