D 51483 (Pages 4) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2008

EC/AI 04 403—ELECTRIC CIRCUIT AND NETWORK THEORY

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *the questions.*

I. Find V(*s*) for the given waveform in Fig. 1. :

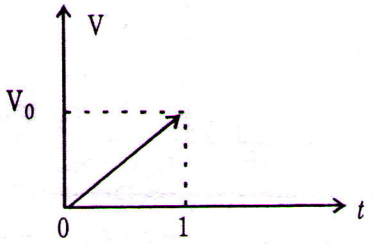

Fig. 1.

2. State and prove initial value theorem.

3. Obtain the input impedance $Z_{in}(s)$ for the circuit in Fig. 2. at (G) $s = 0$, (b) = $s = j\,4$ rad/sec.

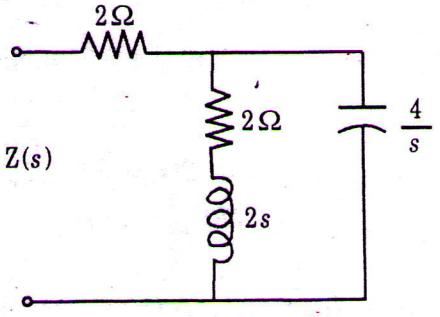

Fig. 2.

4. Construct the pole zero plot for the $H(s) = k\dfrac{s^2 + 50s + 400}{s^2 + 40s + 2000}$.

Turn over

5. Find the Z parameters of the two port circuit given in Fig. 3. :

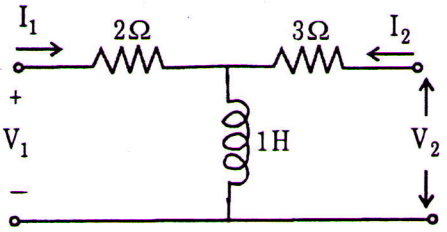

Fig. 3.

6. Find the transmission parameters of the Fig. 4 given, where Z_a and Z_b are non zero.

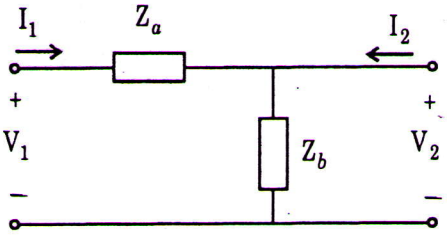

Fig. 4.

7. Derive the expression for : (a) characteristic impedance (b) the cut off frequency of a low pass filter.

8. What are the drawbacks of constant K prototype filters ? What is an *m*-derived section ?

(8 × 5 = 40 marks)

Part B

II. (a) Find the inverse Laplace transform of each of the following functions :—

(i) $F(s) = \dfrac{2s+4}{s^2+4s+13}$.

(ii) $F(s) = \dfrac{2s}{(s^2+4)(s+5)}$.

(6 marks)

(b) Write the time domain equation and find $i_1(t)$ and $i_2(t)$ using Laplace transform methods in Fig.5.

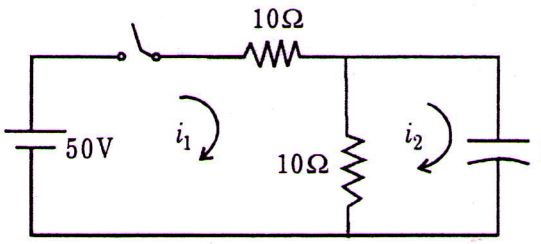

Fig. 5.

(9 marks)

Or

III. (a) A series RLC circuit with R = 5Ω, L = 0.2 H, and C = 1F has a voltage source $v = 10e^{-100t}$ applied at $t = 0$. Find the resulting current.

(10 marks)

(b) Find the Laplace transform of :

(i) $e^{-at}\cos wt$; (ii) $1 - e^{-at}$.

(5 marks)

IV. (a) A passive network in the s domain is given in Fig. 6. :

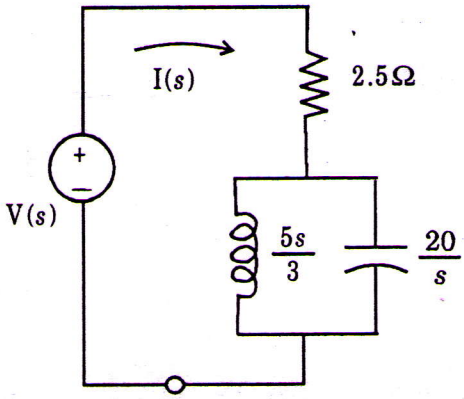

Fig. 6.

Obtain the network function for the current I(s) due to an input voltage V(s).

(10 marks)

(b) Express the impedance Z(s) of the parallel combination of L = 4H and C = 1F at what frequencies 's' is this impedance zero or infinite ?

(5 marks)

V. For the two port network shown in Fig. 7. find the values of R_1, R_2 and C given that the voltage transfer function is $\frac{V_o(s)}{V_i(s)} = \frac{0.2}{s^2 + 3s + 2}$.

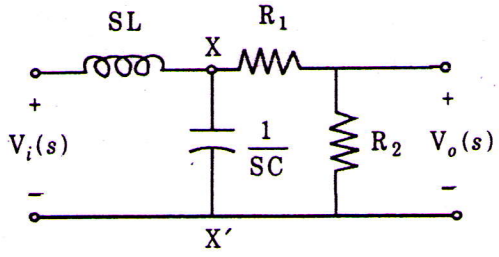

Fig. 7.

(15 marks)

Turn over

VI. Give the defining equation of the hybrid parameters. Write the relations between the *h* parameters and ABCD parameters ? Why are the *h* parameters preferred in transistor equivalent circuit representation ?

(15 marks)

Or

VII. Determine the *y* parameters of the circuit :

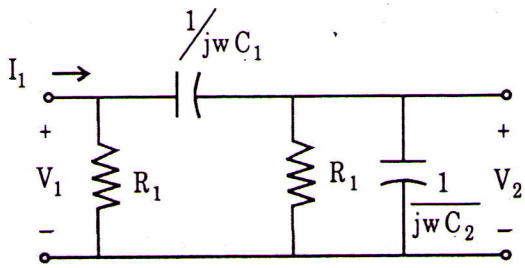

Fig. 8.

(15 marks)

VIII. (a) Derive an expression for the cut off frequency of a T type high pass filter. (6 marks)

(b) Calculate the values of the elements of a high pass filter having a cut off frequency of 1 kHz and operating into a load resistance of 600 Ω.

(9 marks)

Or

IX. Design a prototype low pass filter of nominal characteristic impedance 600 Ω. Given that the poles of the transfer Impedance function of the filter terminated by the nominal characteristic impedance are $7.9 \times 10^3 (-1 \pm j\,1)$. What is the cut off frequency of the filter ?

(15 marks)