D 30900 (Pages : 4) Name.....................................

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

Electrical and Electronics Engineering

EE 09 303/PE EE 09 302—ELECTRIC CIRCUIT THEORY

(2009 Admissions)

Time : Three Hours

Maximum : 70 Marks

Part A

All *questions are* **compulsory.**

1. Obtain the voltage v in the branch shown in Fig. 1 for (a) $i_2 = 1A$, (b) $i_2 = -2A$.

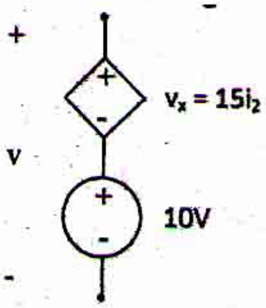

Fig. 1

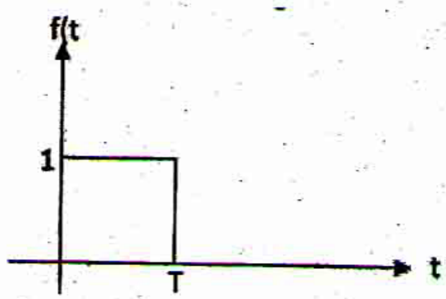

Fig. 2

Fig. 3

2. A series resonant circuit has a bandwidth of 20 kHz and a Q of 40. The resistor value is 10 kΩ. Find the values of L and C in this circuit.
3. Obtain the Laplace transform of the gate function, in Fig. 2 above.
4. Find z_{11} for the single element two-port network in Fig. 3 above.
5. List out any *four* properties of Hurwitz polynominals.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Use superposition to find the current I and the power dissipated in the 10 Ω resistor in the circuit shown in Fig. 4.

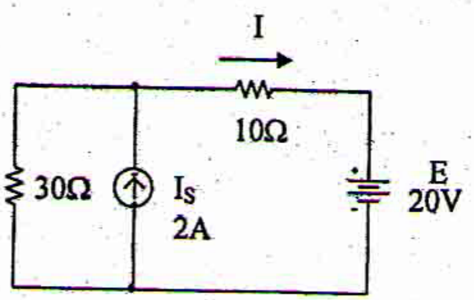

Fig. 4

Turn over

7. For the unbalanced circuit in Fig. 5, find the line currents and phase voltages of the load. Also determine the displacement neutral voltage V_{ON}.

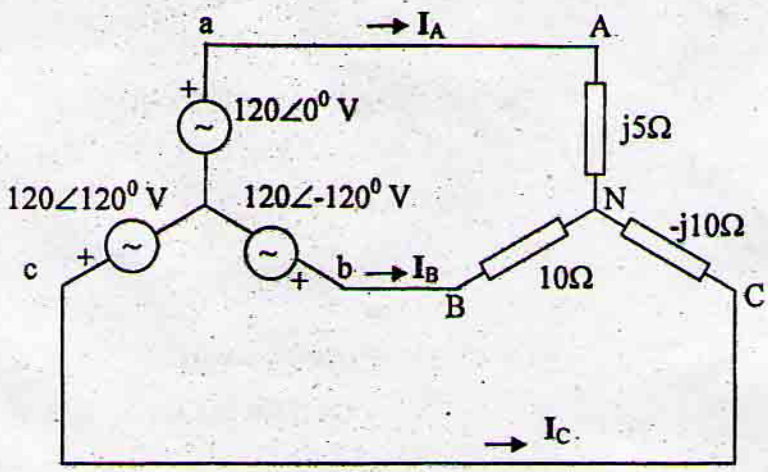

Fig. 5

8. Determine the Laplace transform of the periodic, rectified half-sine wave.

9. Brief the necessary conditions for deriving point impedance.

10. Synthesize the impedance function

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

using first form of Cauer network.

11. The reduced incidence matrix is given by

$$[A]=\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & -1 & 1 & -1 & 0 & 0 \\ -1 & 0 & -1 & 0 & -1 & 0 \end{bmatrix}.$$

Draw the graph corresponding to this matrix. Determine the number of KCL and KVL equations.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. A certain RLC series circuit has a maximum current of 2.5 A when the frequency of a 10 V source is adjusted to obtain this condition. The capacitor in this circuit is a $0.1\mu F$ and the circuit's inductive reactance at this frequency is 50Ω. Find

(a) R, Q, and L.

(b) ω_0 (the resonance frequency) and the circuit bandwidth.

Or

13. Find the line currents for a three-phase three-wire 200 V ABC system feeding.

    (a) A balanced Δ-connected load with a load impedance of $15\angle 45^\circ \Omega$.

    (b) A balanced Y-connected load with a load impedance of $7.071\angle 45^\circ \Omega$.

    when each load is connected alone to the system, and when the loads are connected simultaneously.

14. For series RLC circuit in Fig. 6, the capacitor is initially charged to 1V, find the current $i(t)$ when the switch K is closed at $t = 0$. Use Laplace transform.

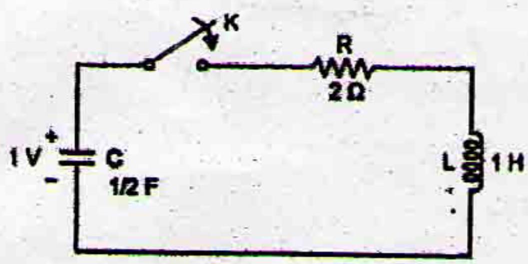

Fig. 6

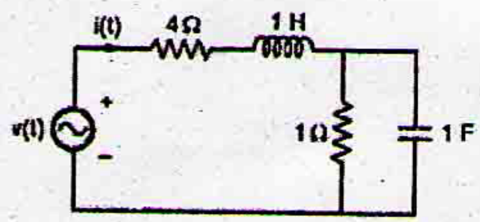

Fig. 7

Or

15. Obtain the pole zero plot of transform impedance of the network in Fig.7 above.

16. Obtain the open circuit impedance parameters for the network in Fig. 8 below.

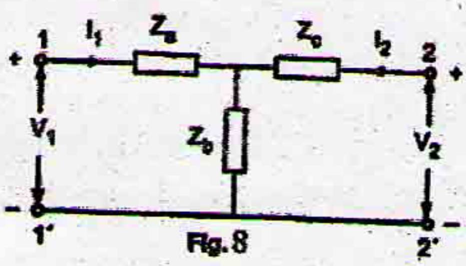

Fig. 8

Or

17. Obtain the Y-parameters of the π network in Fig. 8 above Y_A, Y_B, and Y_C are admittances of the subnetworks.

18. Test whether the following polynomial is Hurwitz.

    (a) $s^3 + 4s^2 + 5s + 2$.

    (b) $s^4 + 7s^3 + 6s^2 + 21s + 8$.

Or

19. Find out the following for the network in Fig. 9 below.

Draw various trees

For a particular tree write fundamental cutest and fundamental loop matrix.

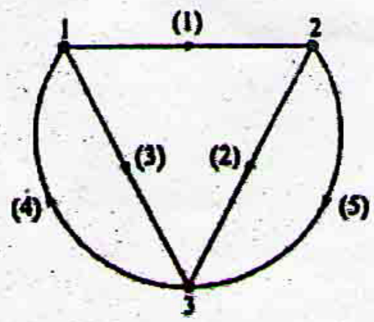

Fig. 9.

(4 × 10 = 40 marks)