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EC 131302

Roll No. of candidate

2019

B.Tech. 3rd Semester End-Term Examination

NETWORK ANALYSIS

(New Regulation)

(w.e.f. 2017 – 2018)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No. 1 and any *Four* from the rest.

1. Answer the following : (Multiple Choice Question) $(10 \times 1 = 10)$

(i) Four resistances 80Ω, 50Ω, 25Ω and R are connected in parallel. Current through 25Ω resistor is 4 A. Total current of the supply is 10 A. The value of R will be.

(a) 66.66Ω (b) 40.25Ω

(c) 36.36Ω (d) 76.56Ω

(ii) The nodal method of circuit analysis is based on

(a) KVL and Ohm's Law

(b) KCL and Ohm's Law

(c) KVL and KCL

(d) KVL. KCL and Ohm's Law

[Turn over

(iii) Superposition theorem is not applicable to networks containing

(a) Nonlinear elements

(b) Dependent voltage source

(c) Dependent current sources

(d) Transformers

(iv) SI unit of conductance is

(a) Volt/Ampere (b) Ampere/volt

(c) Mho (d) Siemens

(v) Which of the following elements is unilateral?

(a) Diode (b) Resistor

(c) Conductor (d) Inductor

(vi) If a 20 V battery is connected across the parallel resistors of 8Ω, 5Ω, 10Ω, how much voltage is there across 8Ω?

(a) 10 V (b) 3V

(c) 5V (d) 20 V

(vii) The coupling between two magnetically coupled coils is said to be ideal if the co efficient of coupling is

(a) 0 (b) 0.5

(c) 1 (d) 2

(viii) A tree has

(a) A closed path (b) no closed path

(c) both (d) none

(ix) Norton's equivalent circuit consists of

(a) Voltage source in parallel with resistance

(b) Voltage source in series with resistance

(c) Current source in parallel with resistance

(d) Current source in series with resistance

(x) For a two port network to be symmetrical

(a) $Z_{11} = Z_{22}$ (b) $Y_{21} = Y_{12}$

(c) $h_{21} = h_{12}$ (d) AD-BC=0

2. (a) Find the currents I_1, I_2 and I_3 for the network shown in Figure 1. (5)

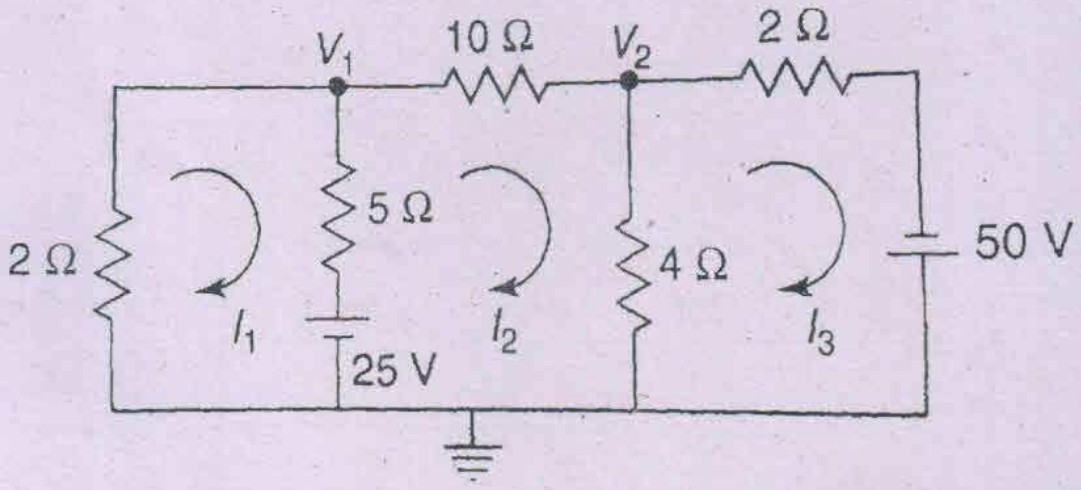

Figure. 1

(b) Find the Norton's current through the 10Ω resistor in the Figure 2. (6)

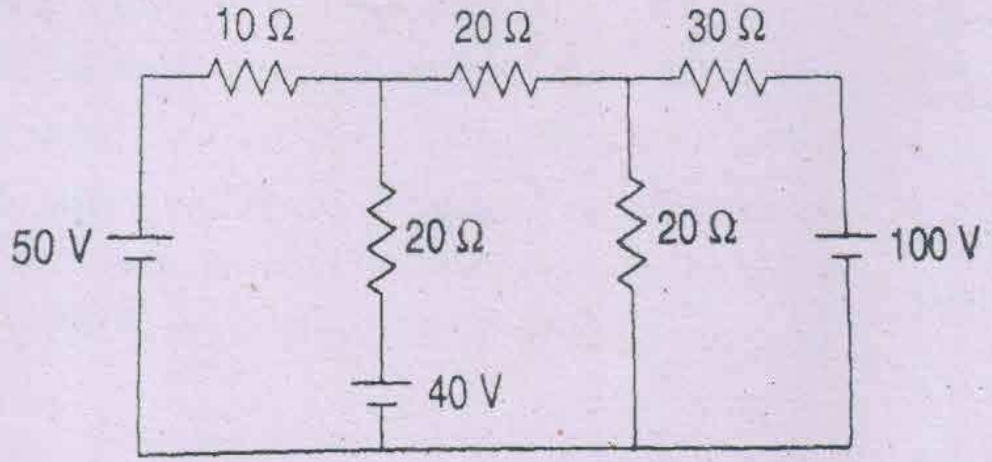

Figure 2

(c) An inductive coil having negligible resistance and 0.1 H inductance is connected across a 200V, 50Hz supply. Find inductive reactance, rms value of current, power and equations of voltage and current. (4)

3. (a) Define Thevenin's theorem and explain it with suitable example. (7)

(b) Find the current through the j5Ω branch for the network shown in Figure 3. (8)

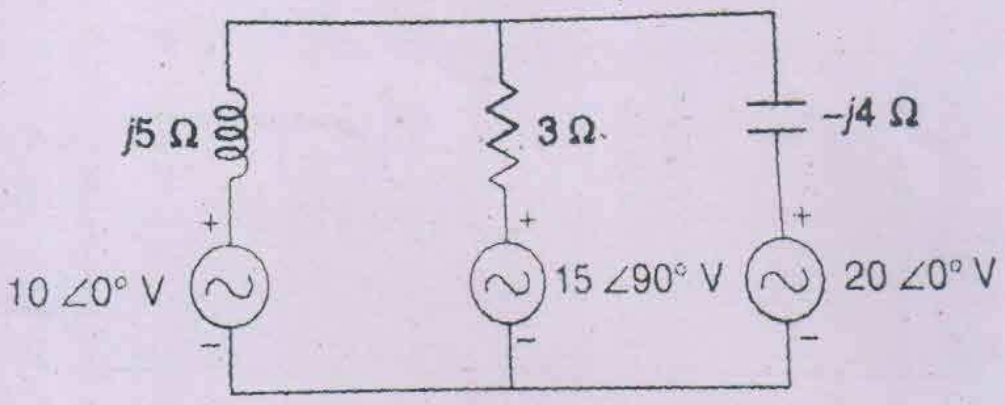

Figure 3

4. (a) Two inductors are connected in parallel. Their equivalent inductance when the mutual inductance aids the self inductance is 12mH and it is 4mH when the mutual inductance opposes the self inductance. If the ratio of the self inductances is 1:3 and the mutual inductance between the coils is 8mH. Find the self inductances. (5)

(b) Find the voltage across the 5Ω resistor in the Figure 4 using mesh analysis. (5)

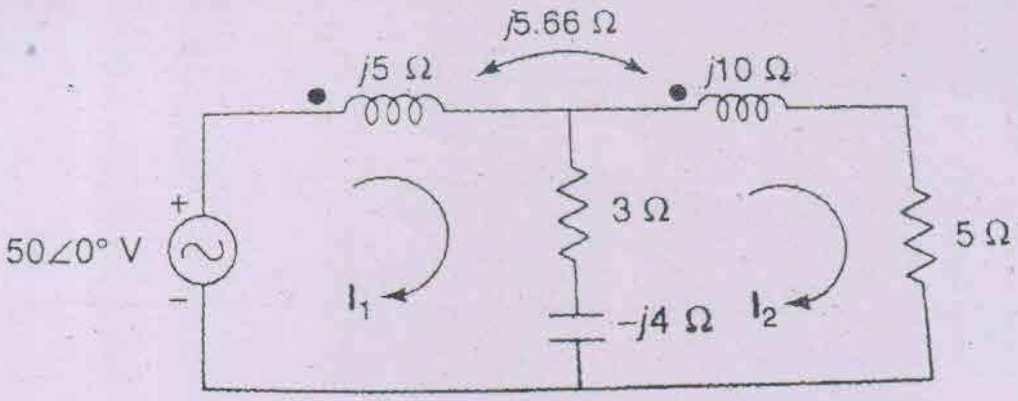

Figure 4

(c) In the network shown in the Figure 5, the switch is closed. Assuming all initial conditions as zero find (i) di/dt and d^2i/dt^2 at $t = 0^+$. (5)

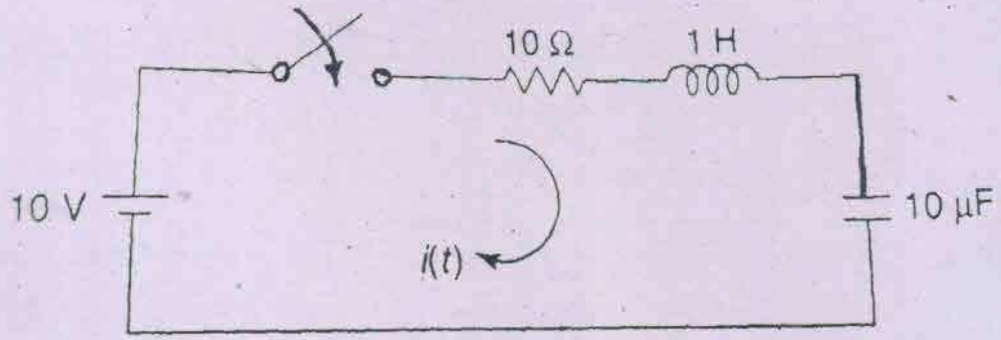

Figure 5

5. (a) The network of Figure 6 is under steady state with switch at the position 1. At t = 0, switch is moved to position 2. Find i (t). (7)

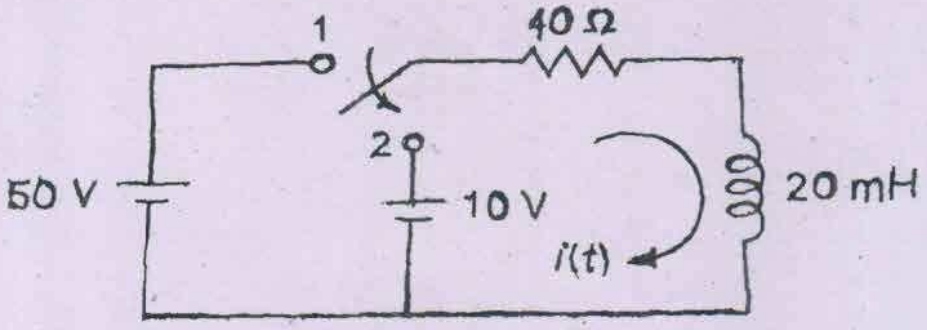

Figure 6

(b) Find the Z parameters for the network shown in Figure 7. (8)

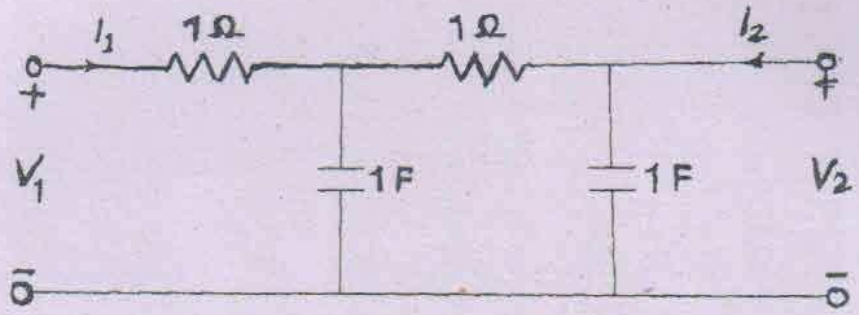

Figure 7

6. (a) What is Hurwitz Polynomial and state its properties.

Test whether the polynomial $P(s) = 2s^4 + 5s^3 + 6s^2 + 3s + 1$ is Hurwitz. (3+4+7)

(b) Realise the Foster form I and II of the following impedance function

$Z(s) = 2(s+2)(s+4)/(s+1)(s+3)$. (8)

7. (a) Write a short note on the following terms (5)
(i) Incidence matrix
(ii) TREE.

(b) For the circuit shown in the Figure 8. draw the oriented graph and write its (i) Incidence matrix (ii) Tie set matrix (iii) Cut set matrix. (10)

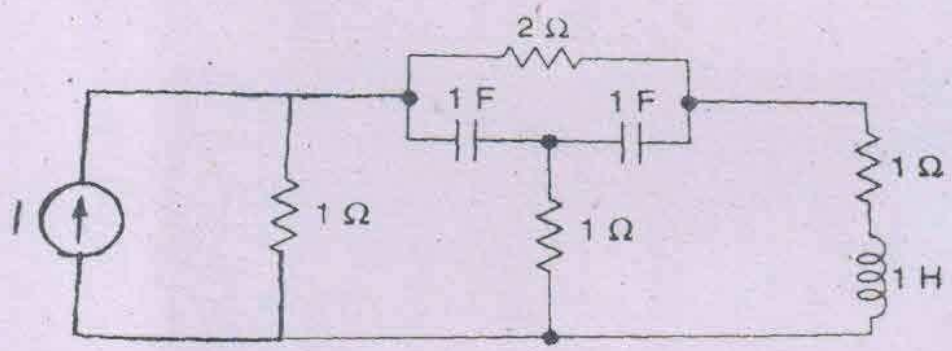

Figure. 8