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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Third Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; Dec - 2016/Jan - 2017

Electrical Circuit Theory

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit*

UNIT - I

1 a. Define the following network elements :

i) Linear and nonlinear network

ii) Dependent and independent sources 6

iii) Active and passive elements.

b. Find the power delivered by 1 A current source as shown in Fig. 1(b) using node voltage analysis. 4

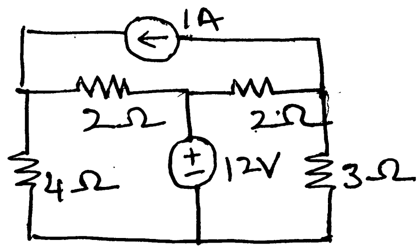

Fig. 1[b]

c. Using mesh current analysis, determine V_2 as shown in Fig. 1(c), that results in zero current through 4 Ω resistor. 10

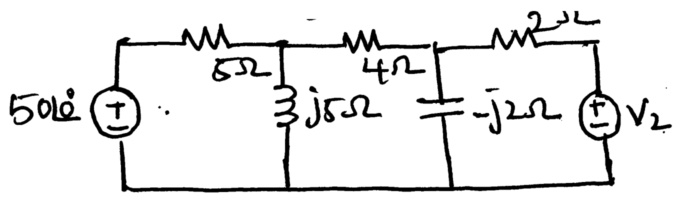

Fig. 1[c]

2 a. Find the current in all resistors as shown in Fig. 2(a) by node voltage method. 10

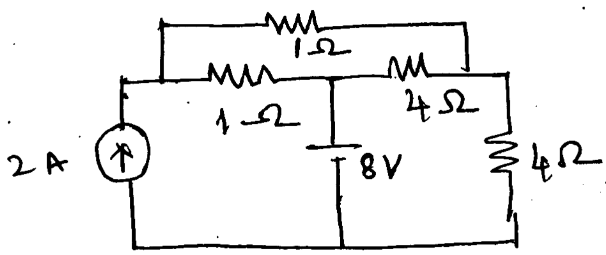

Fig. 2[a]

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b. Reduce the network as shown in Fig. 2(b), to simple voltage source in series with a resistance. 6

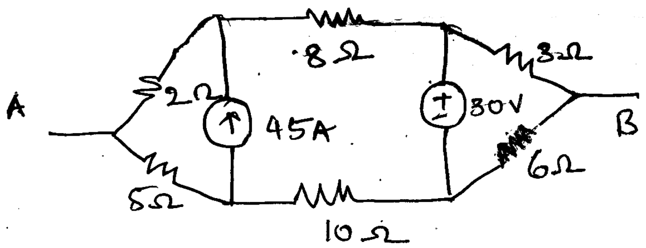

Fig.2[b]

c. Compare node voltage analysis and mesh current analysis 4

UNIT - II

3 a. Define the following with example:

i) Oriented graph ii) Tree 8

iii) Fundamental cutset iv) Fundamental tie set.

b. For the network shown in Fig. 3(b), write a tie set schedule, tie set matrix and obtain equilibrium equation in matrix form using KVL, calculate branch currents and branch voltages. Follow the same orientation and branch number are 4, 5, and 6 are tree branches 12

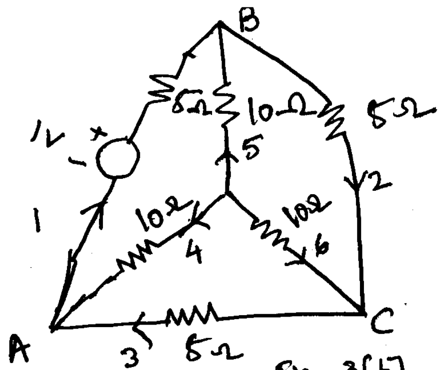

Fig. 3[b]

4 a. Explain with example the principle of duality. 10

b. Draw the oriented graph of the network shown in Fig. 4(b). Select a tree, write the cutset schedule and obtain equilibrium equations. 10

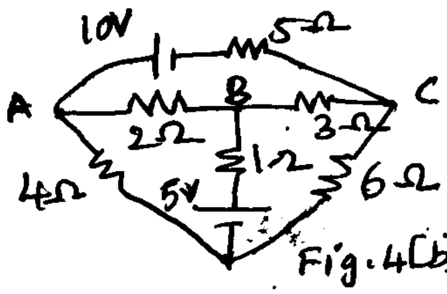

Fig.4[b]

UNIT - III

5 a. In the network shown in the Fig. 5(a), determine the impedance Z_L for which power transfer is maximum. Calculate the maximum power transferred to load. 8

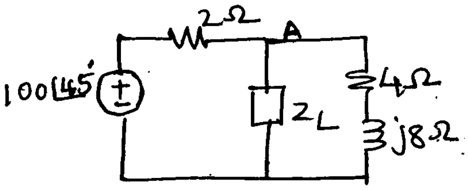

Fig. 5[a]

b. State and prove Millman's theorem. 5

c. Calculate the current *I* for the network shown in Fig. 5(c), using superposition theorem, verify using Millman's theorem. 7

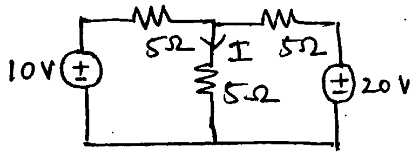

Fig. 5[c]

6. a. Derive the expression for : 10

i) Resonant frequency

ii) Half power frequencies

iii) Quality factor of series RLC circuit.

b. Derive an expression for parallel resonance when *R* and *L* connected in parallel with *C*. 5

c. A coil or resistance 20 Ω and impedance 0.2 H is connected in series with a capacitor across 200 V supply. Find;

i) The value of capacitance for which resonance occurs at 100 Hz 5

ii) The current through and voltage across capacitor

iii) Quality factor of the coil.

UNIT - IV

7 a. Prove that voltage across capacitor and current through inductor cannot change instantaneously. 10

b. In the network, Fig. 7(b) shown $v_1(t) = e^{-t}$ *for* $t \geq 0$ and is zero for all $t < 0$. If the capacitor is initially uncharged, determine the values of $\frac{d^2 v_2}{dt^2}$ *and* $\frac{d^3 v_2}{dt^3}$ *and* $t = 0^+$ 10

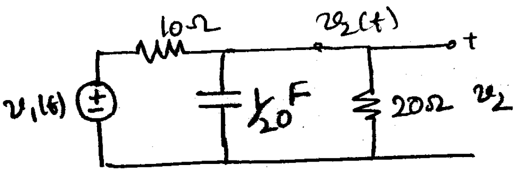

Fig.7[b]

8 a. Find Laplace transform of, 10

i) $s(t)$ ii) t iii) e^{-at} iii) $\sin wt$ iv) $u(t)$.

b. For the circuit shown in Fig. 8(b). Determine the voltage across the capacitor for $t \geq 0$. The capacitor was initially charged to the extent of 2 V before the switch and is closed at $t = 0$. 10

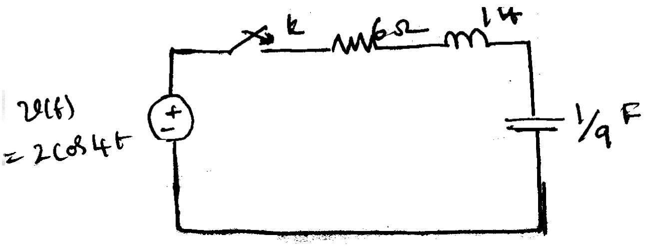

Fig. 8[b]

UNIT - V

9 a. Explain network functions for the one port and two port network. 5

b. What are the poles and zeros? Briefly explain their significance. 5

c. Write down the driving point impedance *z(s)* of the network shown in Fig. 9(c). Locate poles and zeros of *z(s)* on *S* plane. 10

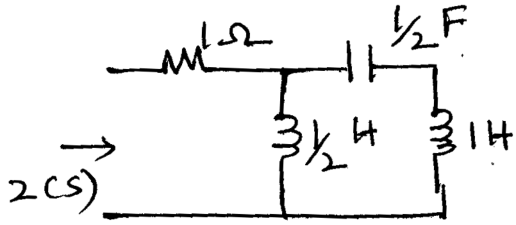

Fig. 9[c]

10a. Obtain ABCD parameters in terms of *Z* parameters. 6

b. Find Y parameters given, 4

$Z_{11} = 20\ \Omega$, $Z_{22} = 30\ \Omega$, $Z_{12} = Z_{21} = 10\ \Omega$.

c. Obtain *h* parameters for the network shown in Fig. 10(c) 10

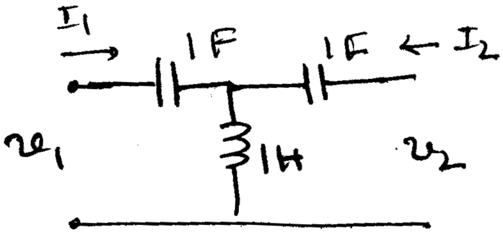

Fig. 10(c)

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