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

(An Autonomous Institution affiliated to VTU, Belgaum)

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

Semester End Examination; Dec. - 2015

Network Analysis - I

Time: 3 hrs *Max. Marks: 100*

Note**: i) Answer any **FIVE** full questions, selecting **ONE** full question from each **unit.
ii) Justify the assumptions made if any.

UNIT - I

1 a. Reduce the network shown in Fig. 1(a) to a single source form about the terminals X, Y. 6

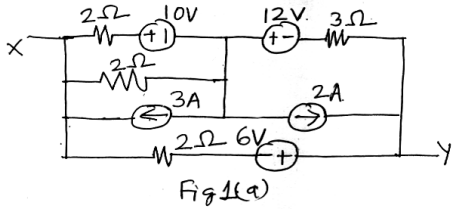

Fig 1(a)

b. Explain the terms: i) Self inductance ii) Mutual inductance iii) Coupling Coefficient iv) Dot convention 6

c. Find the current i_x in the network shown in Fig. 1(c) using nodal analysis. 8

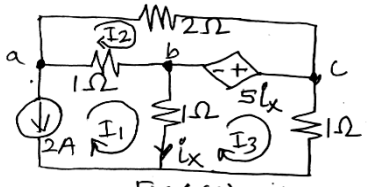

Fig 1(c)

2 a. Derive the equivalent delta impedances of star connected impedances. Find the equivalent resistance R_{XY} for the network shown in Fig. 2(a). 6

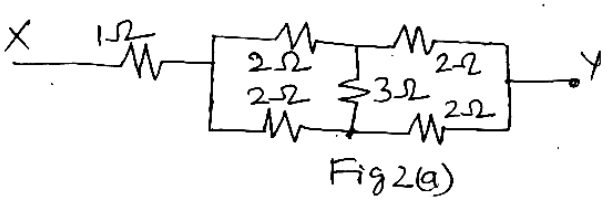

Fig 2(a)

b. Find the current i_x in the network shown in the Fig. 1(c) using loop analysis. 6

c. Find the voltage across the 5 Ω resistor in the network shown in Fig. 2(c). Also find the conductivity coupled equivalent of the network. 8

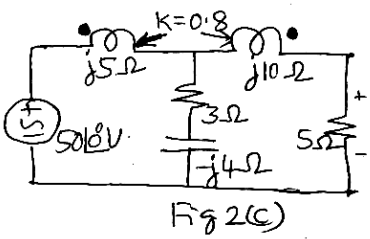

Fig 2(c)

Contd….2

UNIT - II

3 a. Verify reciprocity theorem for the network shown in Fig. 3(a). 6

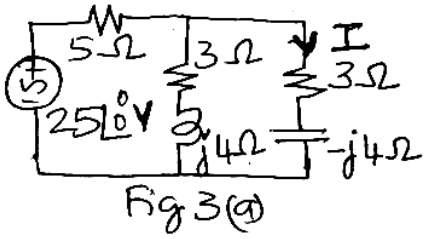

Fig 3(a)

b. A series RLC circuit is excited by a constant voltage variable frequency supply. Draw the variations of all relevant variables as a function of frequency. 6

c. Find using the Norton's equivalent network, the current in the Resistor R for the network shown in Fig. 3(c) 8

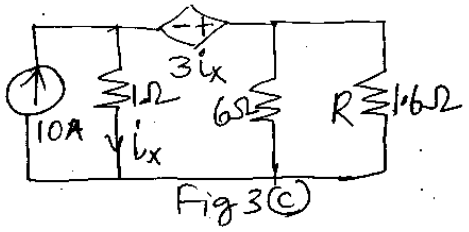

Fig 3(c)

4 a. Find the value of R in the network shown in Fig. 4(a) which receives maximum power from the source. Find this maximum power. 6

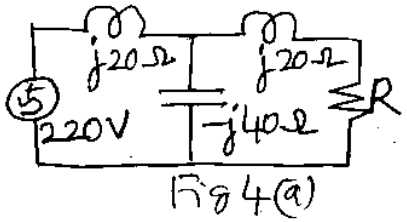

Fig 4(a)

b. Find *I* in the network shown in Fig. 4(b) using superposition principle. 6

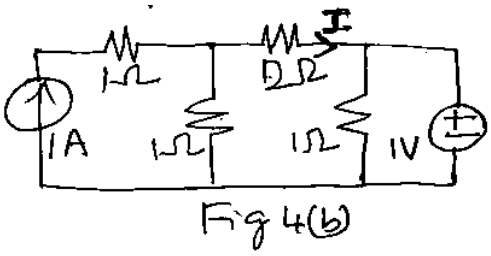

Fig 4(b)

c. A resistance of 1 Ω, a capacitor of 0.5 F and a coil of 1 Ω resistance and inductance of 1 H are all connected in parallel to a supply. Find the resonant frequency and admittance at resonance. 8

UNIT - III

5 a. Show that the locus of the current in a series RL circuit is circular. 6

Contd….3

b. Draw the dual of the network shown in Fig. 5(b).Write the corresponding equations for the two networks. 6

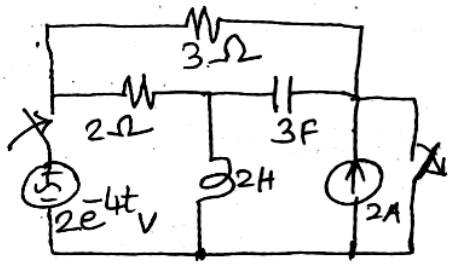

Fig 5(b)

c. Draw the graph of the network shown in Fig. 5(C), select the tree as 4, 5, 6. Find basic cutest matrix. There from, find basic loop matrix. 8

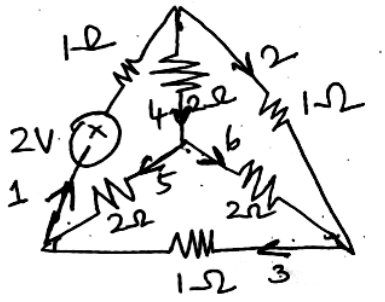

Fig 5(C)

6 a. What are dual elements and dual networks? List the dual elements. Give the stepwise procedure to draw a dual network. 6

b. For the network graph of the network shown in Fig. 5(c) and for the specified tree, obtain the loop equations. 6

c. Consider a parallel circuit with $Z_1 = R_1 + jX_L$ *and* $Z_2 = R_2 - jX_c$. If each one of these four elements is varied one at a time, draw the total current locus in each case. 8

UNIT - IV

7 a. Explain phase sequence, positive sequence and negative sequence of a three phase system. Draw a 3 - wire and 4 - wire three phase system. Establish the relation between line and phase voltages in a star connection. 10

b. A balanced 3-ph, 440 V, RYB sequence supply feeds an unbalanced star load. When the phase R supply voltage is $254\angle -30^{o} V$, the voltage across the phase R impedance load is $200\angle -15^{0} V$. Find the voltage in the other load phase. 10

8 a. The phase current I_{AB} of a balanced delta connected load fed by a 3-phase 220 V, ABC sequence supply is $10\angle -30^{o} A$. Find the line currents. Draw the complete phasor diagram. Find the total power consumed by the load and the resistive part of the load. 10

Contd….4

b. Three impedances $Z_A = 50\angle 0^\circ$, $Z_B = j10\,\Omega$, $Z_C = -j10\,\Omega$ are star connected across a 3 phase, 100 V, ABC sequence supply. Find neutral shift voltage and all the load phase voltages. 10

UNIT - V

9 a. What are the conditions for the existence of FS representation? Give the three forms of the FS expansion of a periodic signal. 8

b. Find the exponential Fourier series of a saw tooth wave form of amplitude A, period of 2π, starting from 0. 12

10 a. Discuss the various symmetries in the FS analysis. 8

b. A series RL circuit with R = 18 Ω, and L = 0.0413 H is fed from a source of *v(t)* given by $v(t) = 180\sin\left(314t + 10^0\right) + 56\sin\left(942t + 35^0\right) + 18\,V$ Find; 12

i) The expression for current

ii) rms value of *v(t)* and *i(t)*

iii) pf of the circuit.

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