Code No: 113BW

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, December-2014

ELECTRICAL CIRCUITS

(Common to EEE, ECE)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

Part- A **(25 Marks)**

1.a) Explain with an example source transformation principle. [2M]

b) Find the voltage V_{ab} for the circuit shown in Fig.1. [3M]

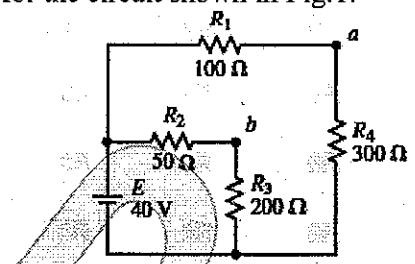

Fig.1

c) Define effective value of an alternating quantity and explain. [2M]

d) A coil has a resistance of 4 Ω and an inductance of 9.55 mH. Calculate, (i) the reactance, (ii) the impedance, and (iii) the current taken from a 240 V, 50 Hz supply. Determine also the phase angle between the supply voltage and current. [3M]

e) Explain the concept of parallel resonance. [2M]

f) Determine the RMS value of the waveform shown in Fig.2. [3M]

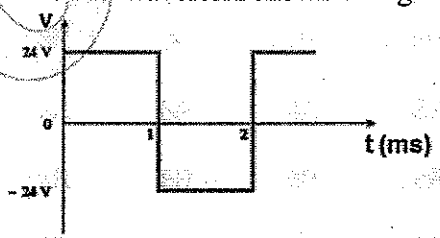

Fig.2

g) Define Graph, Tree for a planar network with an example. [2M]

h) Draw the dual circuit for the network shown in Fig.3. [3M]

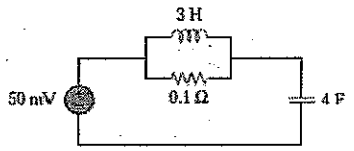

Fig.3

i) State Tellegen's theorem. [2M]

j) Explain the duality existence between Thevenin's equivalent circuit and Norton's equivalent circuit. [3M]

Part- B **(50 Marks)**

2.a) Using Δ-Y or Y-Δ conversion, find the current I and the voltage V_{ab} for the circuit shown in Fig.4.

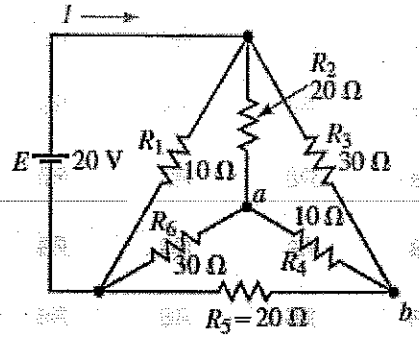

Fig.4

b) Write the nodal equations for the circuit shown in Fig.5 and determine the voltage V_{ab}.

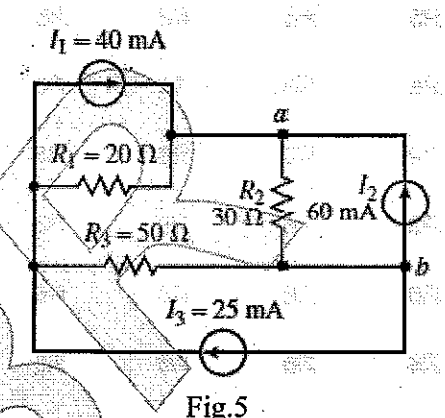

Fig.5

OR

3.a) Find v_x using source transformation shown in Fig.6.

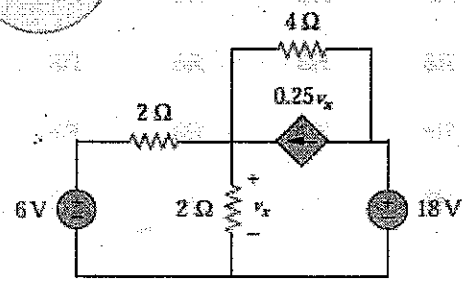

Fig.6

b) Find R_{ab} for the circuit shown in Fig.7.

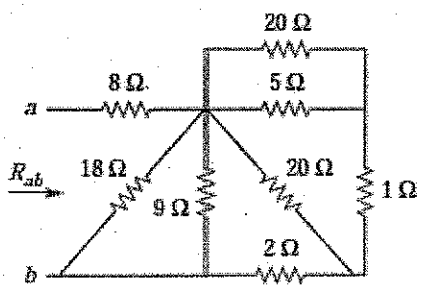

Fig.7

4.a) A coil of resistance 5 Ω and inductance 120 mH in series with a 100 μF capacitor, is connected to a 300 V, 50 Hz supply. Calculate (i) the current flowing, (ii) the phase difference between the supply voltage and current, (iii) the voltage across the coil and (iv) the voltage across the capacitor.

b) Find the input impedance of the circuit shown in Fig.8. Assume that the circuit operates at $\omega = 50$ rad/s.

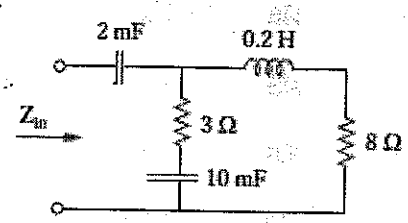

Fig.8

OR

5.a) Determine $v_o(t)$ in the circuit shown in Fig.9.

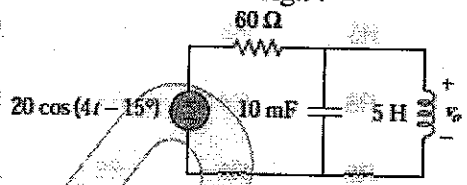

Fig.9

b) Find the rms value of the current waveform of Fig.10 shown. If the current flows through a 9 Ω resistor, calculate the average power absorbed by the resistor.

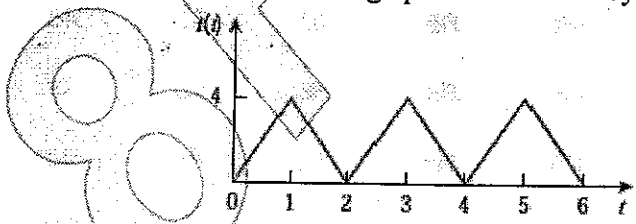

Fig.10

6.a) For an R-L series circuit, with R varied from 0 to ∞, show that current locus is a semi circle.

b) A coil of inductance 0.20 H and resistance 60 Ω is connected in parallel with a 20 μF capacitor across a 20 V, variable frequency supply. Calculate (i) the resonant frequency, (ii) the dynamic resistance, (iii) the current at resonance and (iv) the circuit Q-factor at resonance.

OR

7.a) Explain the following terms:-
i) Faraday's laws of Electromagnetic Induction
ii) Permeability
iii) Magneto motive force
iv) Reluctance.

b) A mild steel closed magnetic circuit has a mean length of 75 mm and a cross-sectional area of 320.2 mm^2. A current of 0.4A flows in a coil wound uniformly around the circuit and the flux produced is 200 μWb. If the relative permeability of the steel at this value of current is 400 find:
i) the reluctance of the material and
ii) the number of turns of the coil.

8. Explain the principle of duality with an example. Draw the dual network for the circuit shown in Fig.11.

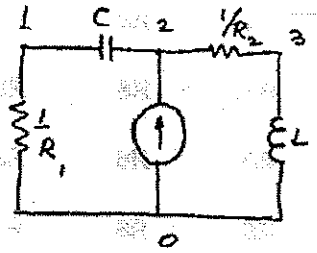

Fig.11

OR

9.a) Define basic cut set and basic loop incidence matrices and write these for the following graph by taking 1, 2, 3 as three branches as shown in Fig.12.

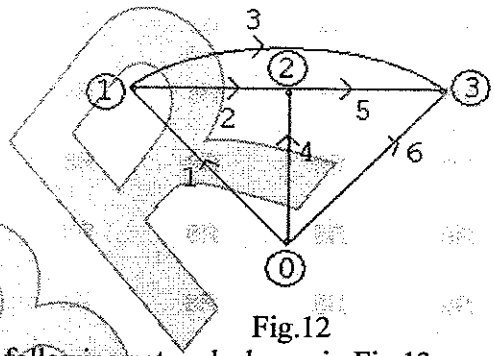

Fig.12

b) Draw the dual of the following network shown in Fig.13.

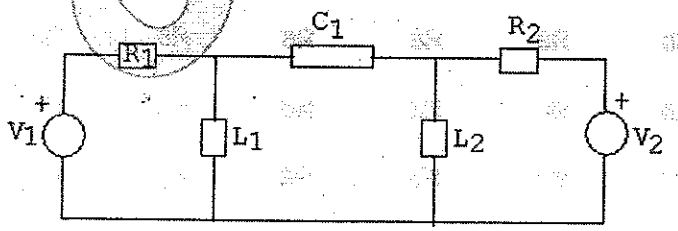

Fig.13

10.a) State and explain thevenin's theorem with an example.

b) Determine the Thevenin's equivalent of the circuit shown in Fig.14.

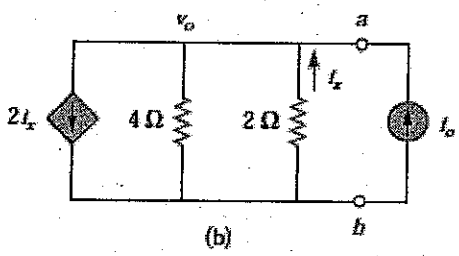

Fig.14

OR

11.a) For the circuit shown in Fig.15, calculate I_x and the power dissipated by the 10 Ω resistor using superposition.

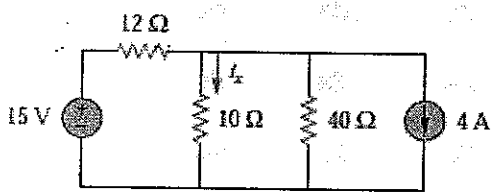

Fig.15

b) State and explain compensation theorem.

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