

Code No: 113BW

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]

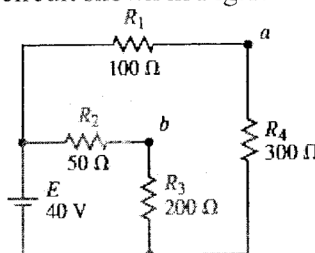


Fig.1

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

d) A coil has a resistance of 4Ω 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]

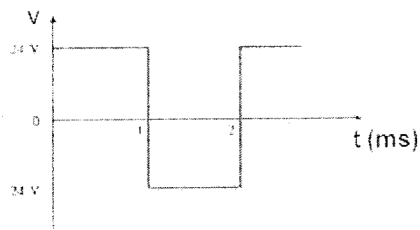


Fig.2

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]

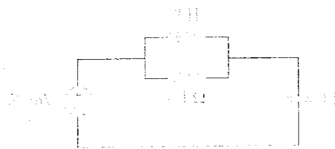


Fig.3

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.

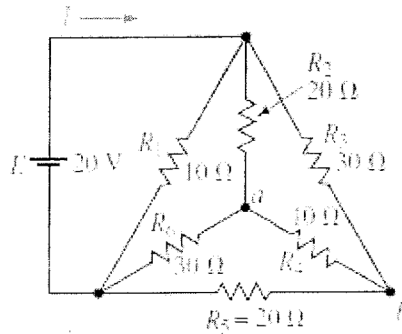


Fig.4

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

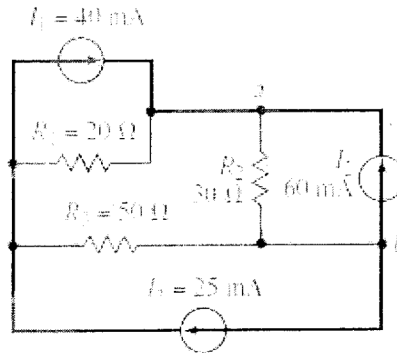


Fig.5

OR

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

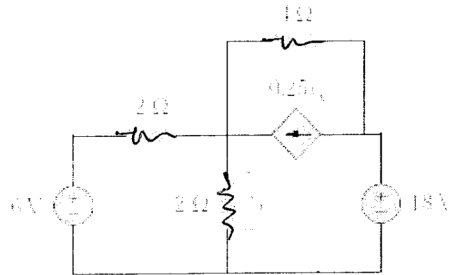


Fig.6

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

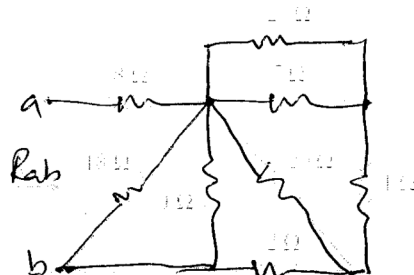


Fig.7

- 4.a) A coil of resistance 5Ω and inductance 120 mH in series with a $100 \mu\text{F}$ 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 $\omega = 50 \text{ rad/s}$.

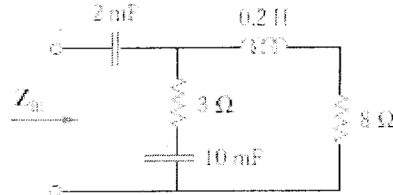


Fig.8

OR

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

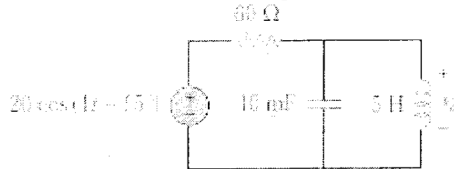


Fig.9

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

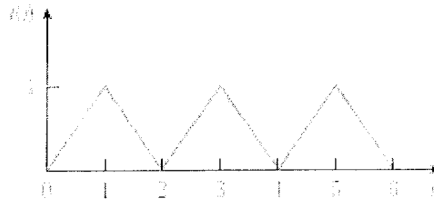


Fig.10

- 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 60Ω is connected in parallel with a $20 \mu\text{F}$ 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:-
- Faraday's laws of Electromagnetic Induction
 - Permeability
 - Magneto motive force
 - 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 0.4 A flows in a coil wound uniformly around the circuit and the flux produced is $200 \mu\text{Wb}$. If the relative permeability of the steel at this value of current is 400 find:
- the reluctance of the material and
 - 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.

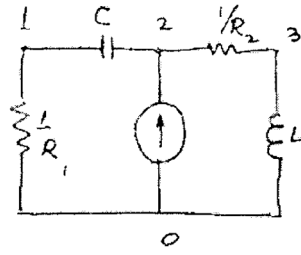


Fig.11

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.

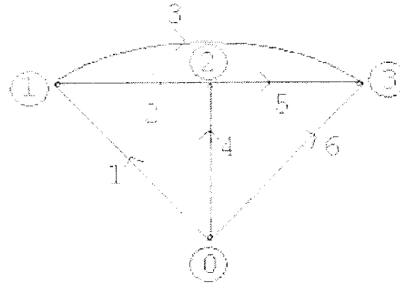


Fig.12

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

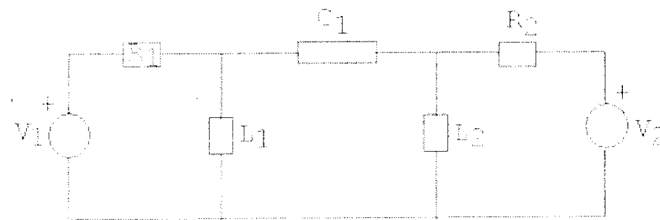


Fig.13

- 10.a) State and explain thevenin's theorem with an example.
 b) Determine the Thevenin's equivalent of the circuit shown in Fig.14.

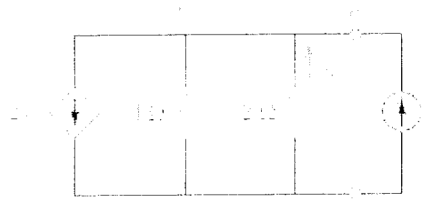


Fig.14

OR

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

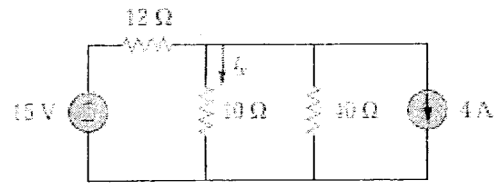


Fig.15

- b) State and explain compensation theorem.

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