3E1149

Roll No.

Total No of Pages: 8

3E1149
B. Tech. III - Sem. (Main) Exam., Dec. - 2018
PCC Electronics & Communication Engineering
3EC4 – 06 Network Theory
EC, EI

Time: 3 Hours **Maximum Marks: 160**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination.

3 Q.1 State Thevenin's theorem.

3 Q.2 What are poles & zeros?

Q.3 Define Q – factor for the series resonant circuit.

Q.4 Define Power Factor.

2 Q.5 State Tellegen's theorem.

Q.6 Write down the Kirchhoff's Laws.

Q.7 Define voltage transfer ratio with reference to a two port network.

Q.8 Define h – parameters.

Q.9 What do you mean by Apparent Power?

Q.10 A voltage of 220V is applied across a 1000 W heater. Determine the following –

(i) Resistance of heater

(ii) Current supplied

PART – B

(Analytical/Problem solving questions) [5×10=50]

Attempt any five questions

Q.1 Explain the concept of Duality. Use mesh analysis to find the current i_x in the network shown in fig 1.1 – [3+7=10]

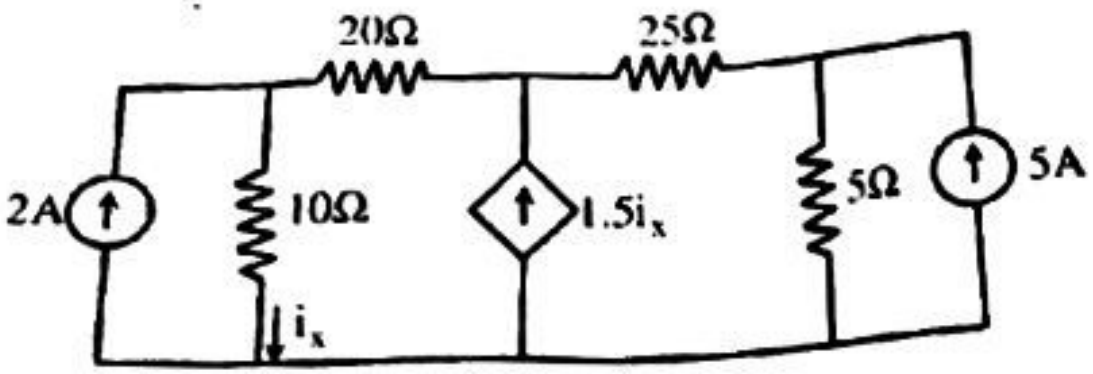

Fig 1.1

Q 2 - State superposition theorem. Using the principle of superposition find v in the circuit of Fig 2.1 – [3+7=10]

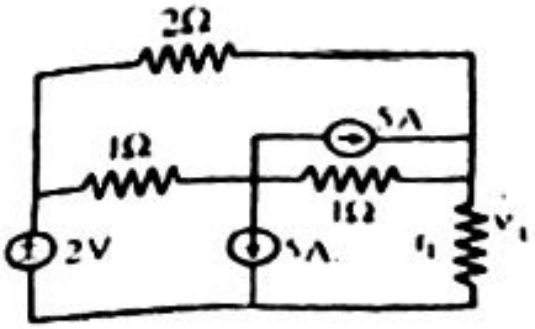

Fig 2.1

Q 3 Find the current in 2Ω resistor using Thevenin's theorem in fig 3.1 Verify the result by Norton's theorem – [10]

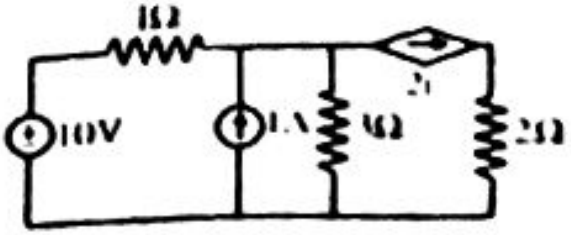

Fig 3.1

Q 4 Determine the Fourier series for the square waveform shown below and plot the magnitude & the phase spectra – [6+2+2=10]

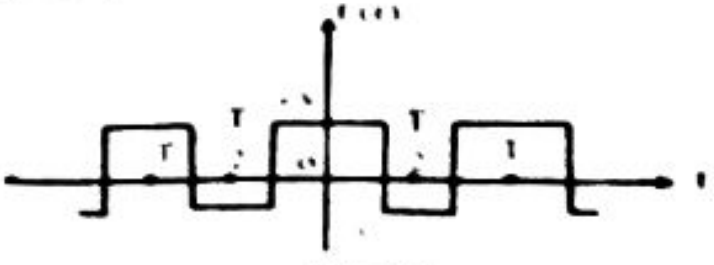

Fig 4.1

Q.5 The series RL circuit shown in fig 5.1 is excited by a DC voltage of 50 V. Assume the initial current flowing through the inductor to be 5A and find the current i(t) for $t > 0$. Use Laplace method – [10]

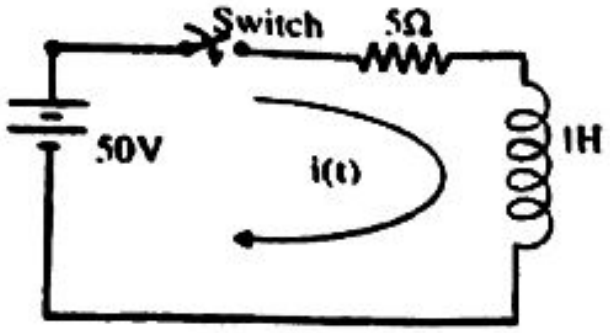

Fig 5.1

Q.6 What is the driving point and transfer impedance of the network shown in fig 6.1– [10]

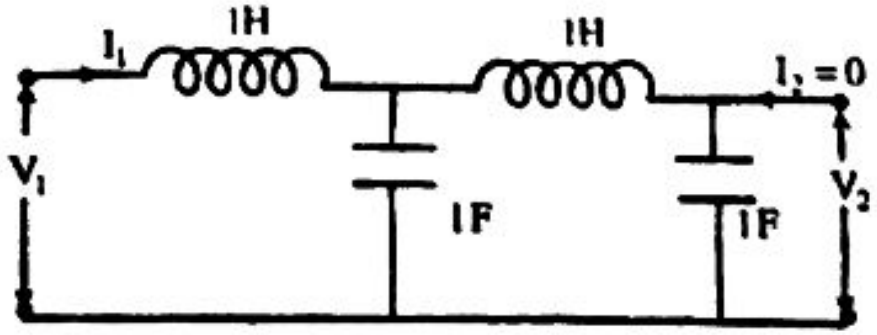

Fig 6.1

Q.7 A 240 V, 100 Hz AC source supplies a series RLC circuit consisting of a capacitor and a coil. If the coil has 55 mΩ resistance and 7 mH inductance. Calculate – [2×5=10]

(i) The value of the capacitor at 100 Hz resonance frequency

(ii) The Q – factor

(iii) The hay power frequencies of the circuit

(iv) Input current at resonance

(v) Maximum instantaneous energy stored in the inductor

PART – C

[4×20=:1]

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any four questions

Q.1 (a) Using the source transformation, find the current through the 3 - Ω resistor sho n [.1]

2 in fig 1.1 –

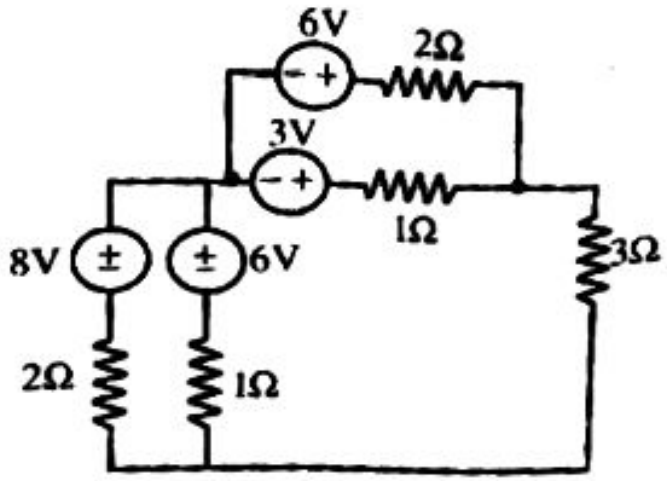

Fig 1.1

(b) Use nodal analysis to determine V_1 and power being supplied by the depend nt [ ]

2 current source in the circuit shown in fig 1.2 –

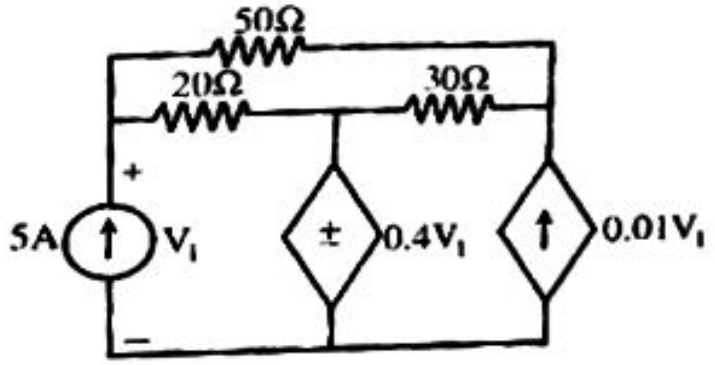

Fig 1.2

Q.2 (a) State and explain Maximum Power Transfer theorem and prove the theorem. [8]

(b) Find the maximum power transfer through Z_L of the circuit shown in fig 2.1. [12]

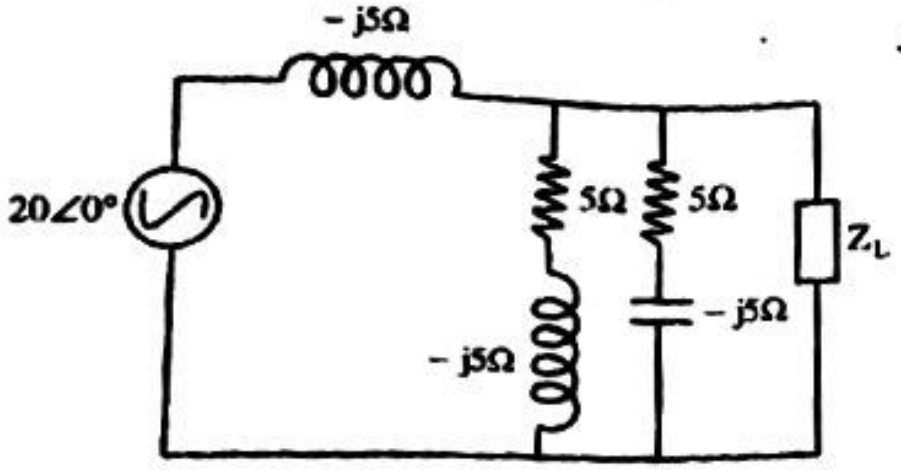

Fig 2.1

Q.3 (a) Determine the Fourier series of the repetitive waveform of Fig 3.1 [14]

(i) Up to the 7th harmonic when the repetition time T = 25π ms.

(ii) Determine the fundamental frequency current in the circuit of fig 3.1 (b) where, R = 15Ω & L = 0.0438 H with voltage transform as in fig 3.1 (a).

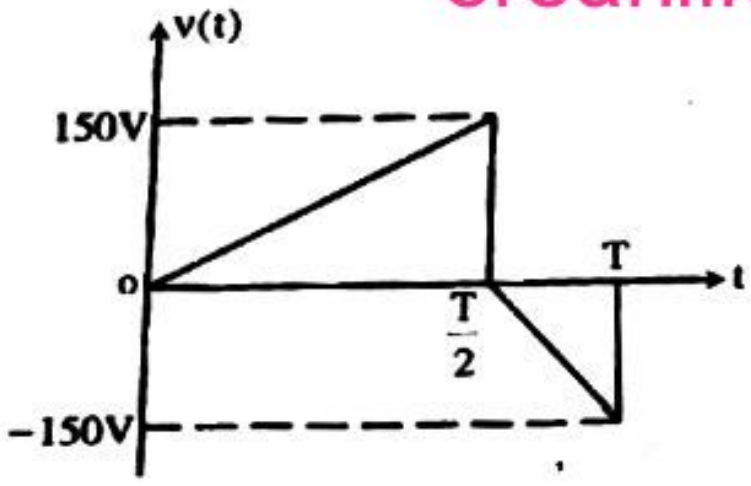

Fig 3.1 (a)

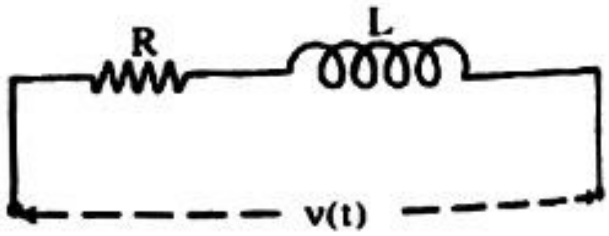

Fig 3.1 (b)

(b) The voltage $V_i(t) = 5e^{-5t}\,u(t)$ volt is applied to the input of RC circuit shown in fig 3.1 (c). Determine the 1 - Ω energy available at the filter output – [6]

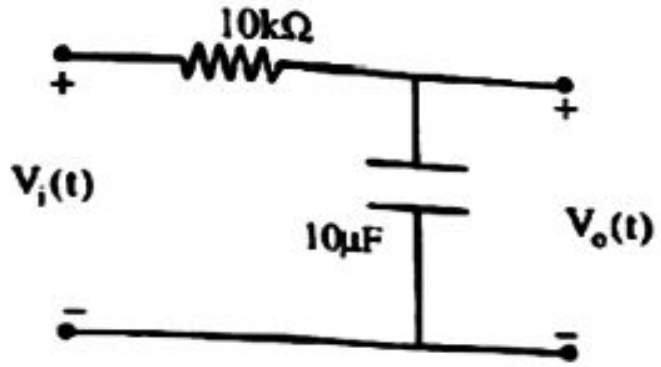

Fig 3.1(c)

Q.4 (a) Determine the current i(t) in a series RLC circuit consisting of R = 5Ω, L = 1H and $C = \frac{1}{4}$ F. When the source voltage is given as – [12]

(a) Ramp voltage 12r (t -2) and

(b) Step voltage 3u (t – 3). Assume that the circuit is initially relaxed.

(b) The response of a network to an impulse is $h(t) = 0.18(e^{-0.32t} - e^{-2.1t})$. Find the response of the network to a step function using the convolution theorem. [8]

Q.5 (a) Write a short note on types of Filters. [10]

(b) Determine Z – parameter & Y – parameter of the following circuit shown in fig 5.1 – [10]

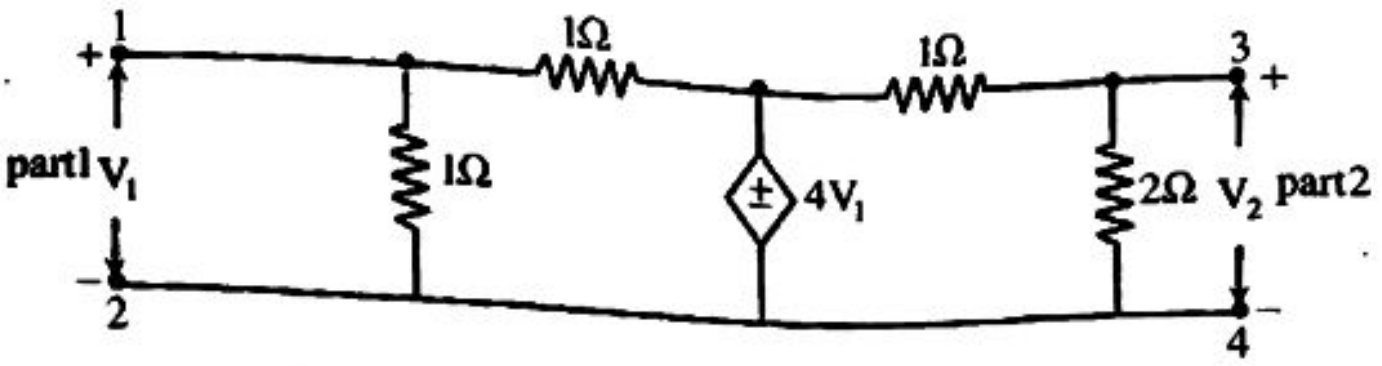

Fig 5.1