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Roll No. _____ Total No of Pages: 7

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B. Tech. III Sem. (Main) Exam., Dec. - 2019

Common for ECE/EIC

3EI4-06 Network Theory

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

Instructions to Candidates:

Part – A: *Short answer questions (up to 25 words) 10 × 3 marks = 30 marks. All ten questions are compulsory.*

Part – B: *Analytical Problem Solving questions 5 × 10 marks = 50 marks. Candidates have to answer five questions out of seven.*

Part – C: *Descriptive/Analytical/Problem Solving questions 4 × 20 marks = 80 marks. Candidates have to answer four questions out of five.*

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 materials is permitted during examination (Mentioned in form No. 205)

1. NIL 2. NIL

PART - A

Q.1 State and explain superposition theorem.

Q.2 State and explain Thevenin's theorem.

Q.3 State the Tellegen's theorem and verify it by illustrations.

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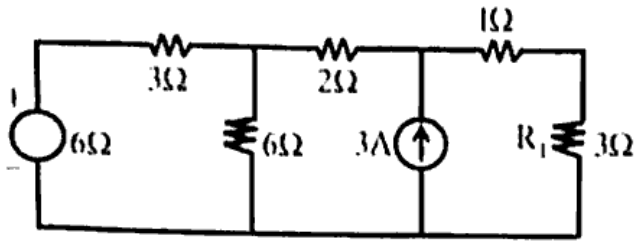
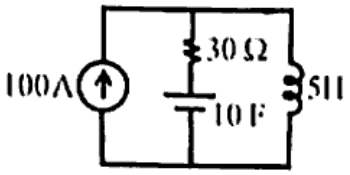
Q.4 Use source conversion technique to find the load current I in the circuit shown below -

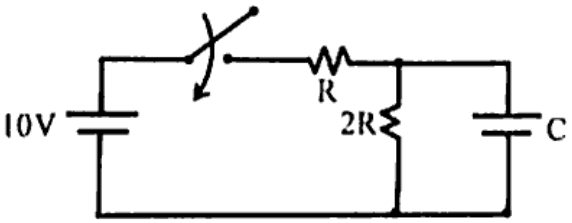


Q.5 Draw the dual circuit of figure shown below -



Q.6 Find the Laplace transform of $f(t) = 1 - e^{-at}$ where 'a' is a constant.

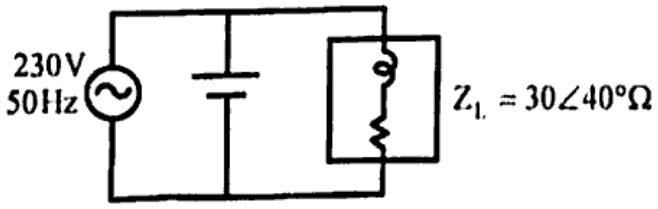
Q.7 Find the time constant of network given below -



Q.8 Explain the concept of complex frequency.

Q.9 How voltage and current sources are defined? Explain in brief.

Q.10 In the circuit shown in figure, what value of C will cause a unity power factor at the AC source.



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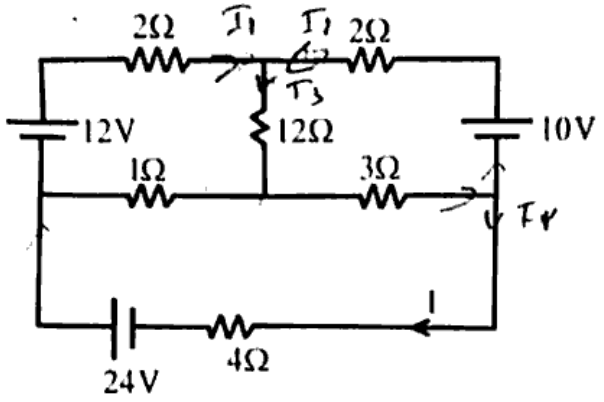
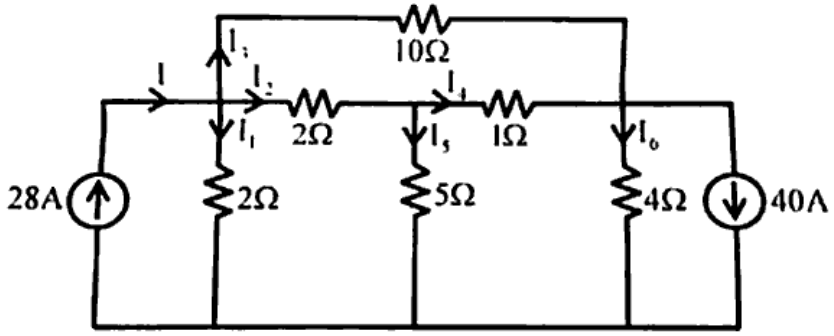
PART – B

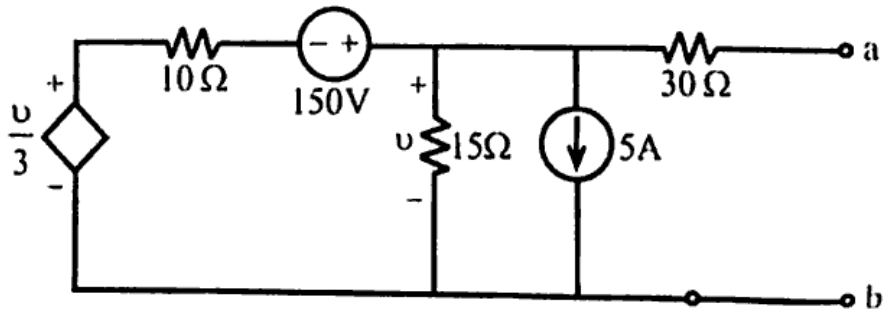
Q.1 Determine the current in the 4 - Ω branch in the circuit shown below



Q.2 Use nodal analysis method to find currents I_1, I_2, I_3, I_4, I_5 and I_6 in the circuit shown below –



Q.3 State and explain reciprocity theorem. Find the Thevenin's equivalent circuit with respect to terminals a & b of the network given below –



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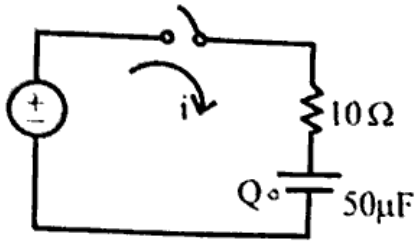
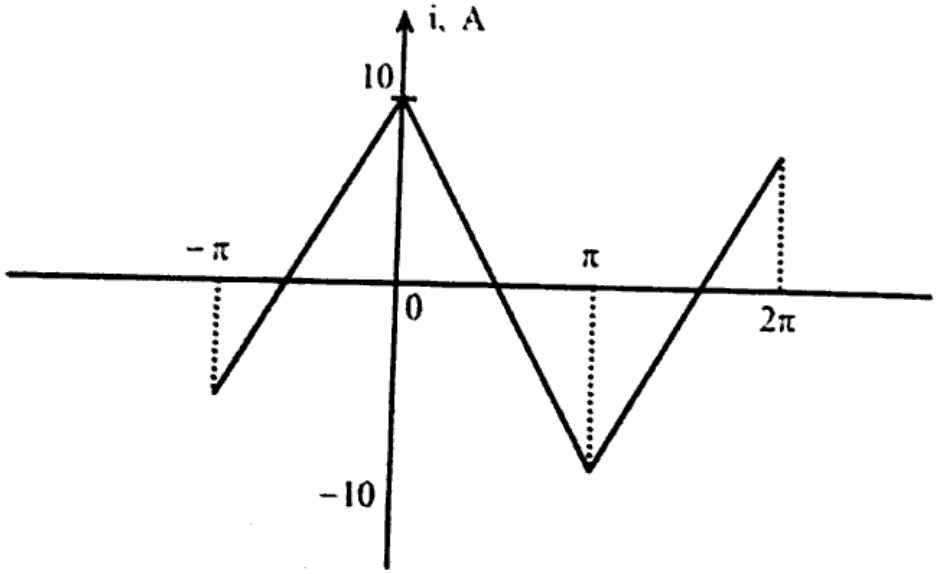
Q.4 State and explain maximum power transfer theorem. Also find the expression for max power transfer across the open terminals A and B.

Q.5 In the series RC circuit shown below the capacitor has an initial charge 2.5 mC. At t = 0, the switch is closed and a constant voltage source V = 100V is applied. Use the Laplace transform method to find the current i.



Q.6 A 3- ϕ, 4 wire system having a 24V line to neutral voltage has the following loads connected between the respective lines and neutral; $Z_R = 10\angle 0°\Omega$, $Z_Y = 10\angle 37°\Omega$, $Z_B = 10\angle -53°\Omega$. Calculate the current in neutral wire and the power taken by each load when phase sequence is RYB. http://www.mgsuonline.com

Q.7 The current in a 10mH inductance has the waveform shown in figure below. Obtain the trigonometric series for the voltage across the inductance, given that ω = 500 rad/sec.



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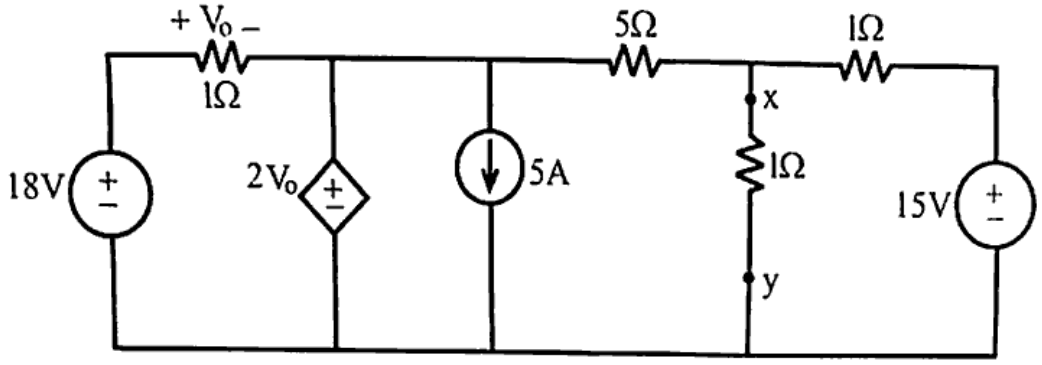
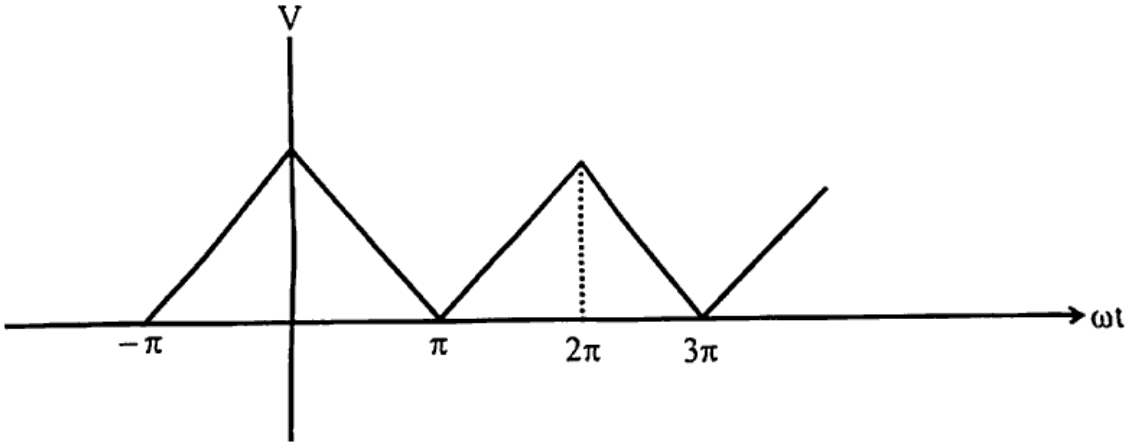
PART – C

Q.1 Determine current through 1Ω resistor across x – y in the circuit shown below using Thevenin's theorem.

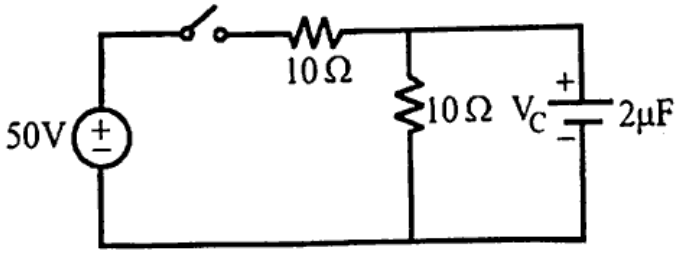


Q.2 Find the exponential Fourier series for the triangular Wave shown below-



Also plot the line spectrum.

Q.3 For the circuit given below, the switch is closed at t = 0. Obtain the current i and capacitor voltage V_C for t > 0



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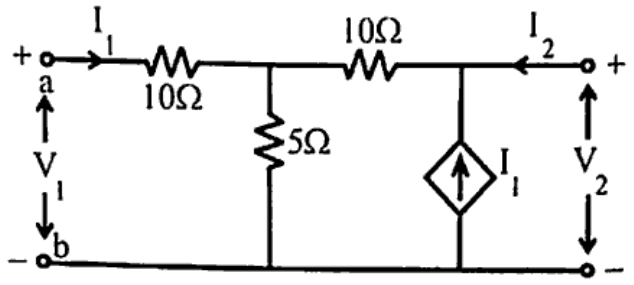
Q.4 (a) Determine the z – parameters of the network shown in figure below –



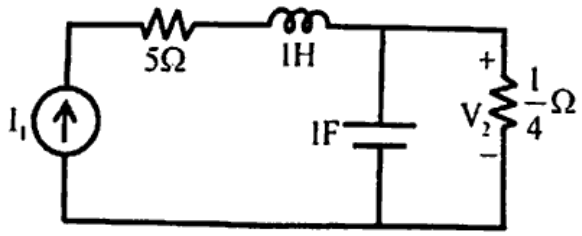
(b) Following short circuit currents and voltages are obtained experimentally for a two port network :

(i) With output short circuited : $I_1 = 5$ mA, $I_2 = -0.3$mA, $V_1 = 25$V

(ii) With input short circuited : $I_1 = -5$ mA, $I_2 = 10$ mA, $V_2 = 30$V

Determine Y – parameters.

Q.5 (a) Find the pole zero plots of the driving point and transfer impedance of the given network.



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(b) In a LCR type band stop filter R = 1kΩ, L = 115 mH, C = 400 pF. Determine -

(i) The band width

(ii) Cut – off frequencies

(iii) Output voltage at f_r, f_1 and f_2.

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