(c) Define Resonance in Series RLC Circuit. Obtain the expressions for resonant frequency ω_0, the two half power frequencies ω_1 and ω_2, bandwidth B and the quality factor Q for the Series RLC Circuit. (6)

[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5824 **K**

Unique Paper Code : 2512011102

Name of the Paper : Circuit Theory and Network Analysis

Name of the Course : **B.Sc. (H) Electronics (DSC II)**

Semester : I

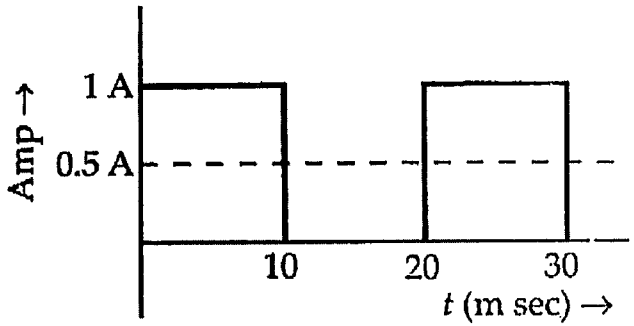
Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

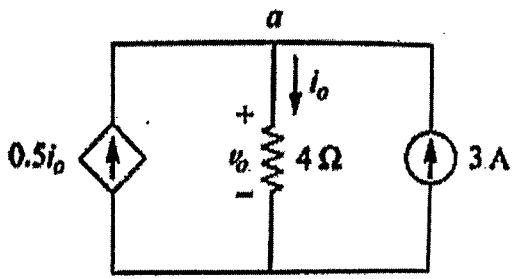
1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **seven** questions in all, out of which you have to attempt any **five** questions
3. **All** questions carry equal marks.
4. **First** Question is Compulsory.
5. Use of Non-Programmable Scientific Calculator is allowed.

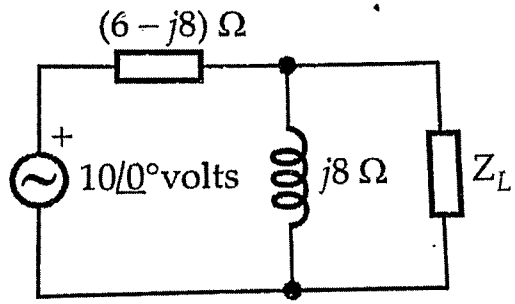
1. (a) Differentiate between an Ideal and Practical voltage source with the help of symbolic representation and I-V characteristics. (3)

(b) Find the rms value of the current waveform shown in figure below. (3)



(c) Calculate the current io through 4Ω resistor for the circuit given below. (3)





7. (a) Design a Low-Pass RC Filter having cut-off frequency f_c = 2.4 KHz. Draw the frequency response of the designed circuit. (6)

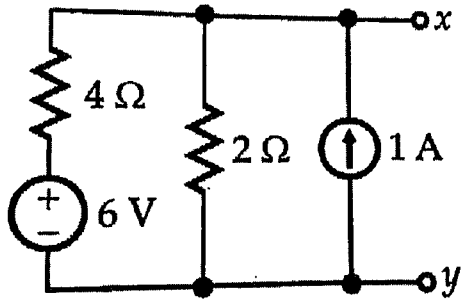
(b) A Series circuit comprises a 10 Ω resistance, a 5 μF capacitor, and a variable inductance L. The supply voltage is 20 ∠0° volts at a frequency of 318.3 Hz. The inductance is adjusted until the p.d. across the 10 Ω resistance is a maximum. Determine for this condition (6)

(i) the value of inductance L,

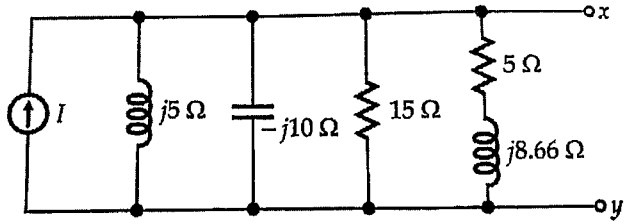
(ii) the p.d. across each component, and

(iii) the Q-factor.

P.T.O.



(b) For I = 33 ∠ −13° Amp, find the Thevenin equivalent of the following circuit. (8)



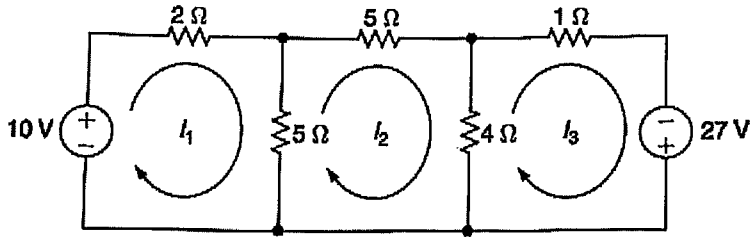
(c) Find the value of load impedence in the following circuit to extract maximum power from the source. (4)

(d) Explain the Principle of Duality in electrical networks. Give one example of a dual pair. (3)

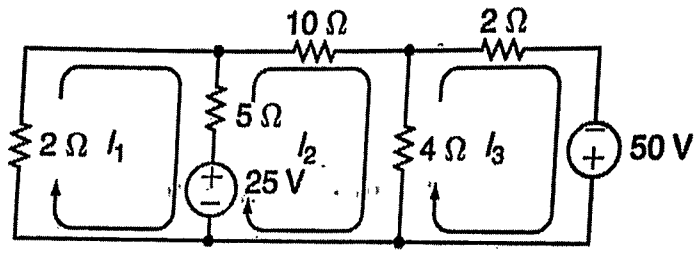
(e) Differentiate between the ideal and practical response of High Pass RC Filter. (3)

(f) Write down the formulae for converting a delta network (consisting of Z_1, Z_2 and Z_3) into a star network (consisting of Z_A, Z_B and Z_C). (3)

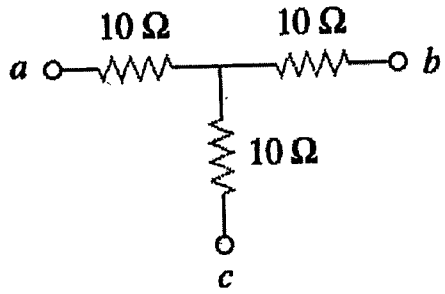
2. (a) Apply the mesh current method to the network shown below and write the matrix equations by inspection. Obtain current I_1. Also obtain contribution of each source to I_1. (6)



(b) Solve for the mesh currents in the network shown below by using node voltage method. (6)

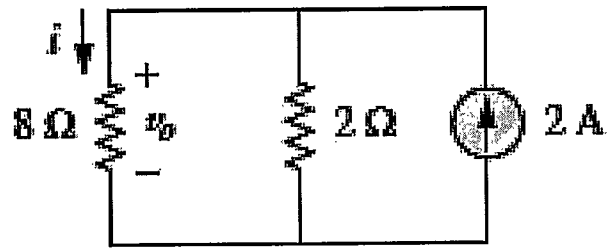


(c) (i) Convert the following Star network to its equivalent Delta network. (6)

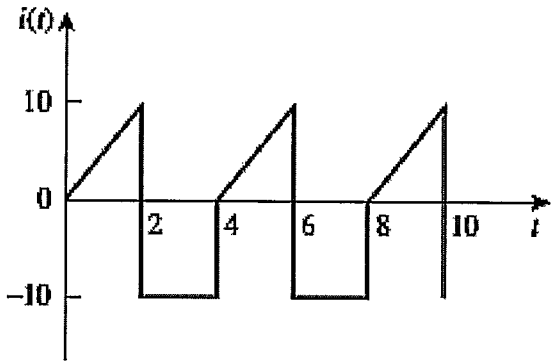


(b) State and prove Maximum Power Transfer theorem. (8)

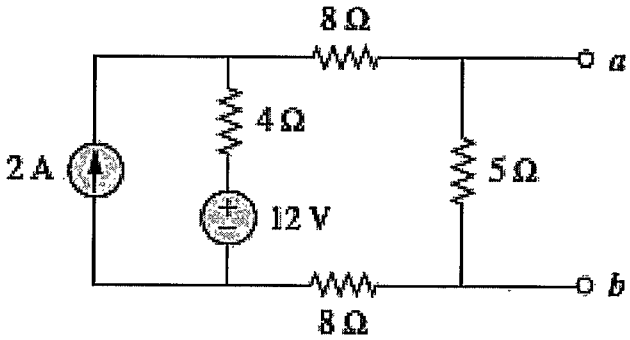
(c) Calculate the voltage v_0 across 8 ohm resistor by transforming the current source to voltage source in the following circuit. (4)



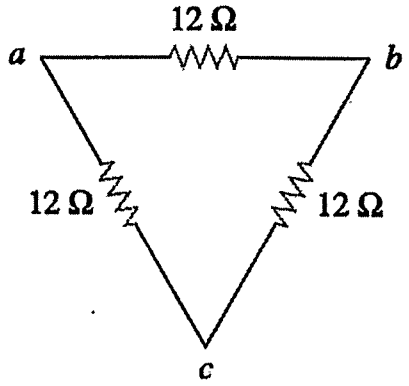
6. (a) Find Millman's equivalent for the left of the terminals x-y after converting current source to voltage source. (6)



5. (a) Find the Norton equivalent of the following circuit across terminals a-b. (6)

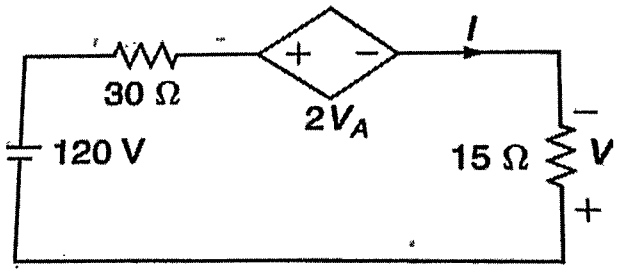


(ii) Convert the following Delta Network to its equvalent Star network.

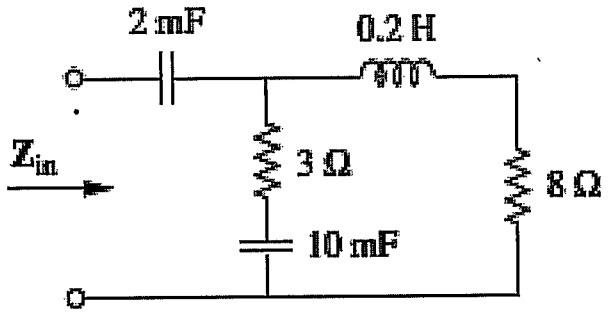


3. (a) What are the various types of controlled sources. Explain briefly using symbolic represtation. (4)

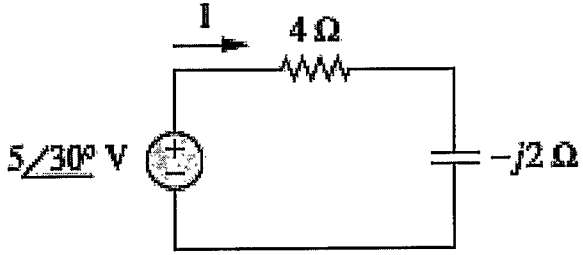
(b) In the circuit shown below, what is the power absorbed by each element. (7)



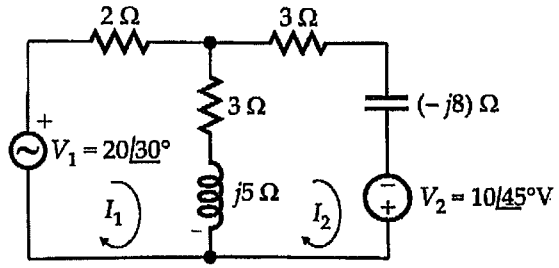
(c) Determine the value of input impedance of the following circuit at ω = 50 rad/s. (7)



4. (a) In the following circuit, find the (i) average power supplied by the source, (ii) average power absorbed by the resistor and (iii) average power absorbed by the capacitor. (6)



(b) Find the value of current (I_2) flowing through capacitor in the following circuit using Mesh analysis. (6)



(c) Find the rms value of the current waveform shown in figure below (6)