[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1376 **I**

Unique Paper Code : 2512011102

Name of the Paper : Circuit Theory and Network Analysis

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

Semester : I (under NEP UGCF)

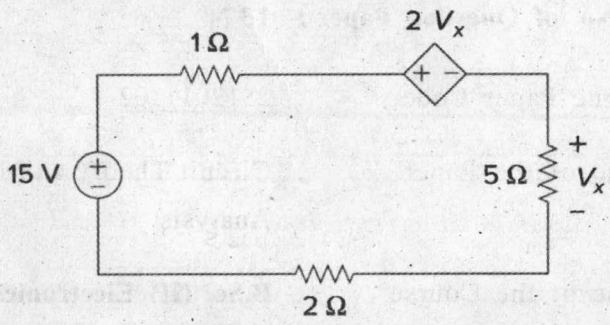
Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question no. **1** is compulsory.
3. Attempt **five** questions in all, including question no. **1**.
4. Use of non-programmable scientific calculators is allowed.

P.T.O.

1. (a) Find V_x in the following circuit : (3)

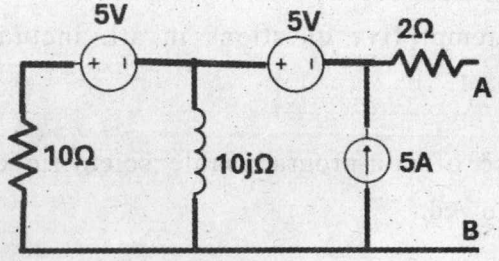


(b) What is a supemode? Explain with an example. (3)

(c) Define reactive power. What is its value for a pure resistance. (3)

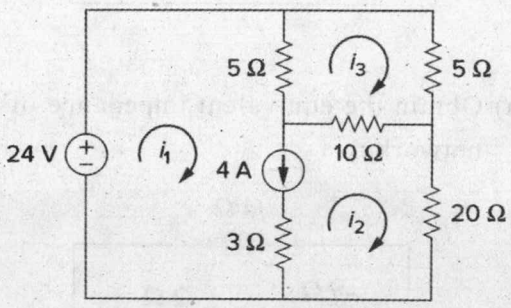
(d) State Millman's theorem. (3)

(e) Calculate the Thevenin's equivalent resistance across terminals AB. (3)

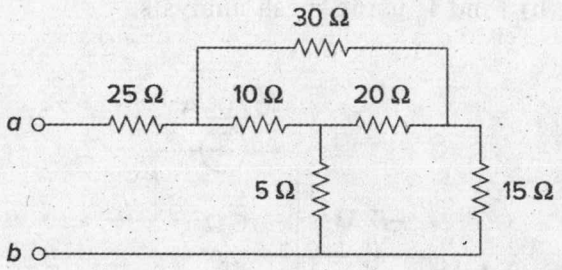


(f) Define the terms quality factor and bandwidth. (3)

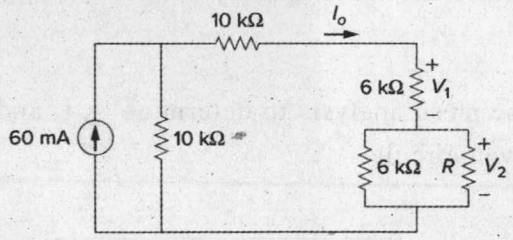
2. (a) Use mesh analysis to determine i_1, i_2 and i_3 in the given circuit (6)



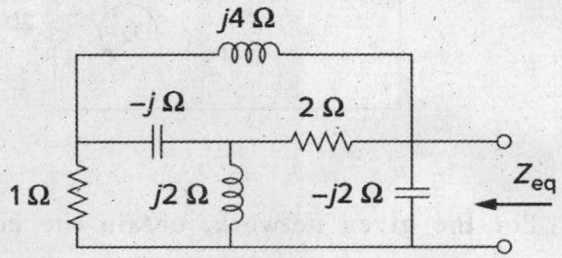
(b) For the given network, obtain the equivalent resistance at the terminals a-b (6)



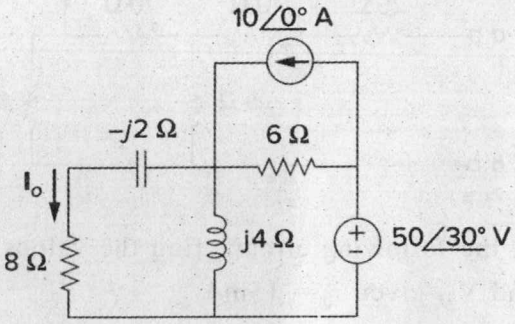
(c) In the following circuit, find the values of R, V_1 and V_2, given i_0 = 15mA (6)



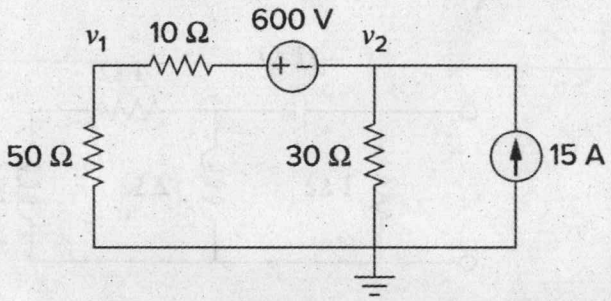
3. (a) Obtain the equivalent impedance of the following network : (6)



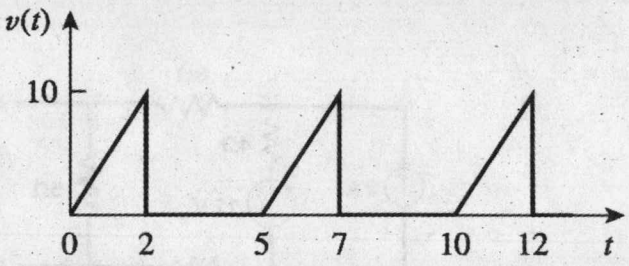
(b) Find I_0 using mesh analysis. (7)



(c) Using node analysis, calculate v_1 and v_2 in the following circuit (5)

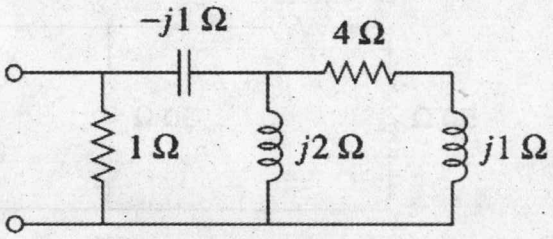


4. (a) Find the rms value, average value and form factor for the given waveform (8)

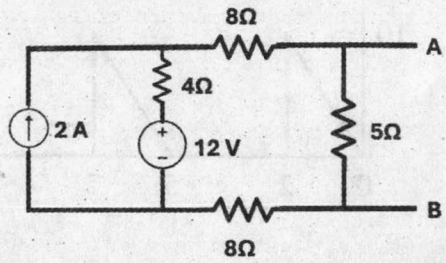


(b) Given $v(t) = 112 \cos(\omega t + 10^\circ)$ V and $i(t) = 4 \cos(\omega t - 50^\circ)$ A, find the average power and the reactive power. (4)

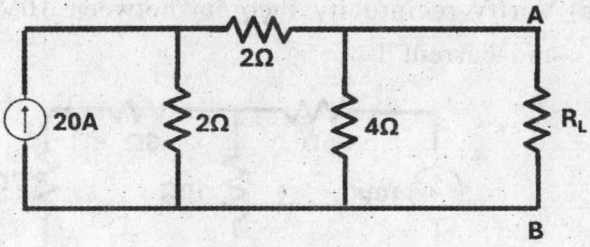
(c) Obtain the power factor for the following circuit. Specify whether the power factor is leading or lagging. (6)



5. (a) Determine the Norton's equivalent circuit across terminals AB. Also find I_{AB} if a 6Ω resistance is connected across terminals AB. (8)

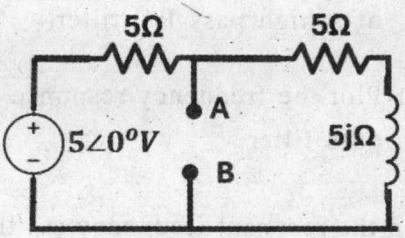


(b) Find the value of R_L for maximum power transfer. Also, find the maximum power. (6)

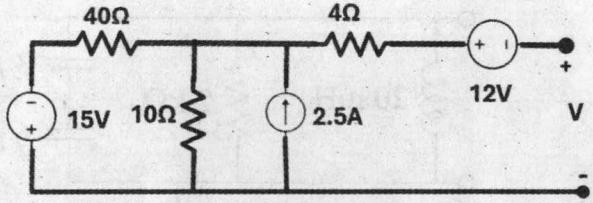


(c) State and prove the Superposition Theorem. (4)

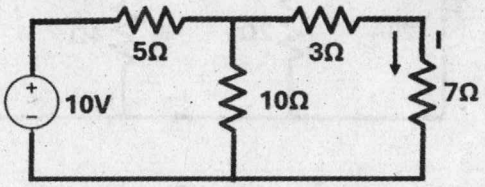
6. (a) Find the Thevenin's equivalent circuit across terminals AB. Also, calculate the voltage across 10Ω resistance if it is connected across the terminals AB. (7)



(b) Determine voltage 'V' using superposition theorem (7)



(c) Verify reciprocity theorem between 10V source and current I (4)



7. (a) Can a Bandstop Filter be made using a Low Pass Filter and a High Pass Filter? Explain your answer briefly. (4)

(b) (i) Derive an expression for the cutoff frequency of a high pass RC filter.

(ii) Plot the frequency response of an ideal high pass filter. (6)

(c) Find the resonant frequency ω_0, the quality factor Q, and the bandwidth B for the following RLC circuit : (8)