This question paper contains 6 printed pages. *Your Roll No. .....*

Sl. No. of Ques. Paper : 944 **G**
Unique Paper Code : **251104**
Name of Paper : **Network Analysis : ELHT-103**
Name of Course : **B.Sc. (Hons.) Electronics**
Semester : **I**
Duration : : **3 hours**
Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all.
Question No. 1 is compulsory.
All questions carry equal marks.
Use of non-programmable scientific calculator is allowed.

1. Attempt *all* parts of this question:

(a) How to implement:

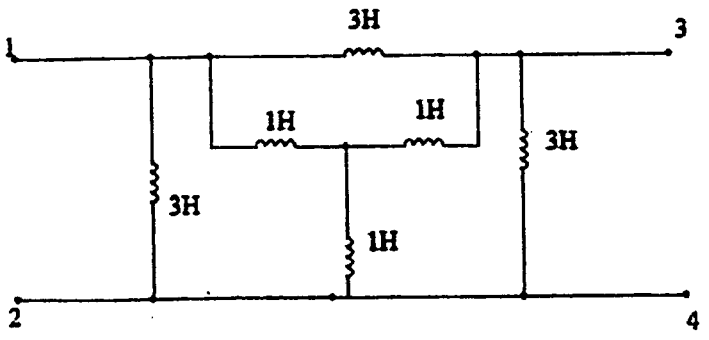
(i) 10 A current source if two 5 A current sources are available .

(ii) 10 V voltage source if two 5 V voltage sources are available.

(iii) 150 μF capacitor if only 100 μF capacitors are available. 3

(b) What is power factor? Explain its significance. 3

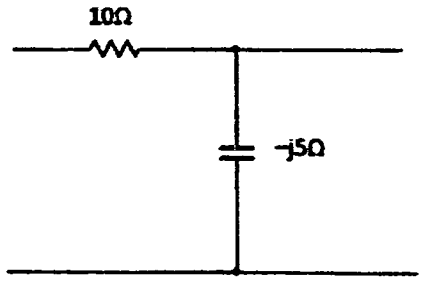
(c) Find the equivalent inductance between terminals 1 and 2: 3



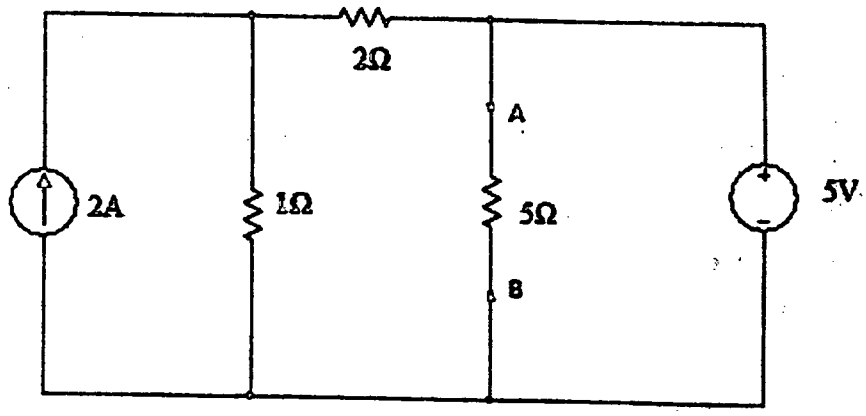
(d) In a series RL circuit having R=2 Ω , L=10 H with the DC voltage of 100 volts find the value of current after 5 ms of switching ON. 3

(e) Find the Y parameters for the given circuit. 3

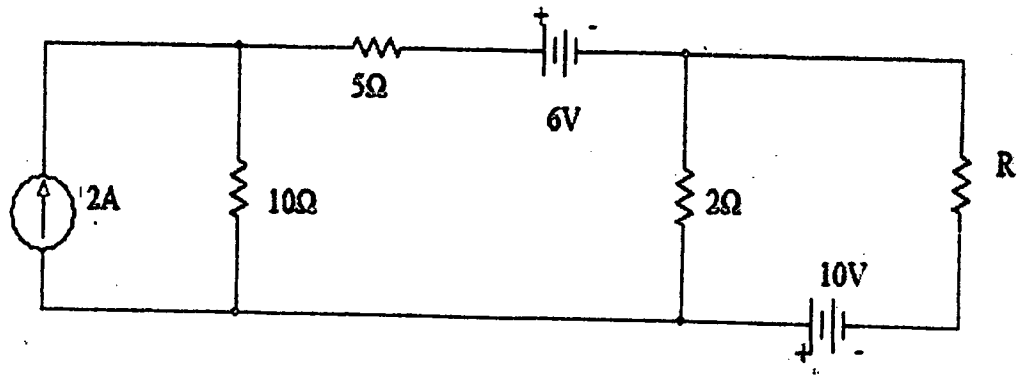
P. T. O.



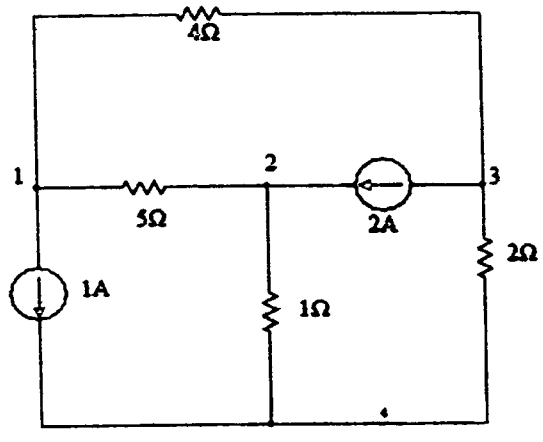
2. (a) Find the Thevenin equivalent of the given circuit. Determine the current through 5 Ω load resistor. Justify that the Thevenin equivalent circuit is equivalent to an ideal voltage source. 5



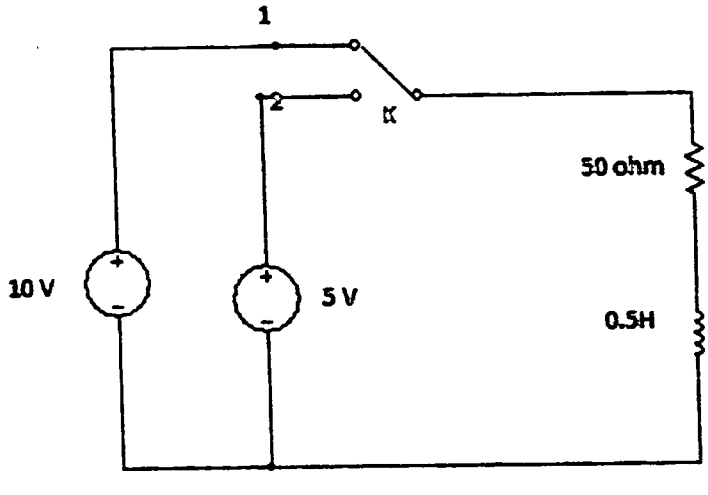
(b) Find R to have maximum power transfer in the given circuit. Also obtain the amount of maximum power transferred. 5



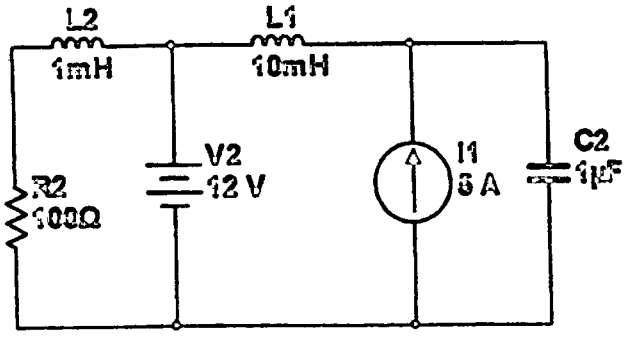
(c) Find the current through 5 Ω resistor using nodal analysis. 5



3. (a) In the given circuit switch is in position 1 for sufficient time to establish the steady state and then moved to switch 2. Find the current in both the conditions and sketch the transient. 6



(b) What is duality? Obtain the dual of the circuit given below. 5



(c) A current $i=I_m \sin \omega t$ passes through a series RC circuit. Determine the voltage across each element and draw the voltage and current waveforms (properly depicting the relative phase difference) for each element. 4

P.T.O.

4. (a) Find whether the parallel RLC circuit with R=200 Ω, L=0·28 H, C=3·57 μF and initial capacitor voltage of 50 V would oscillate or not. Obtain the voltage function for $t \geq 0$. 6

(b) The input and output waveforms for the circuit given in figure A are shown in figure B. Find:

(i) Time t for the capacitor voltage almost reaching the input maximum.

(ii) The bandwidth of pass band for the filter formed by the given series RC circuit. 3

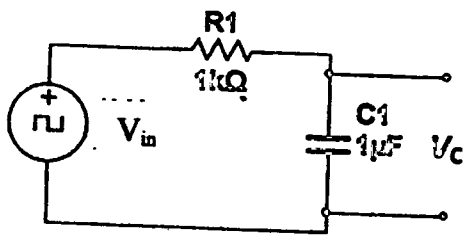


Figure A

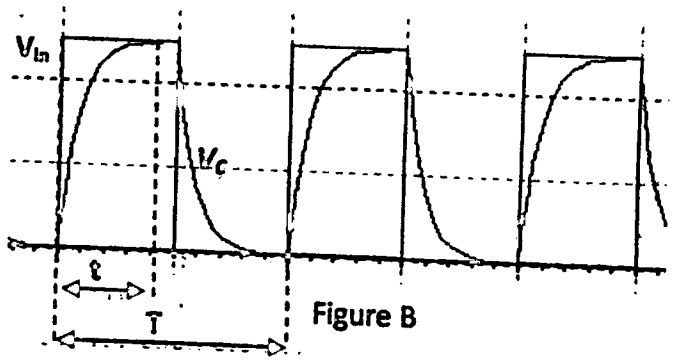


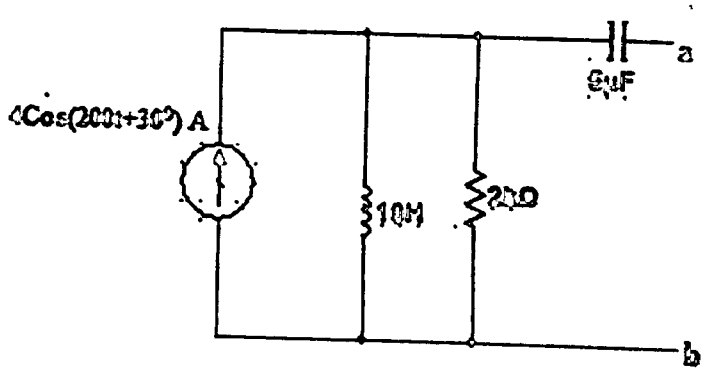
Figure B

(c) (i) For the circuit in figure A, explain the effect of increasing the input frequency on the capacitor voltage for the following 3 cases:

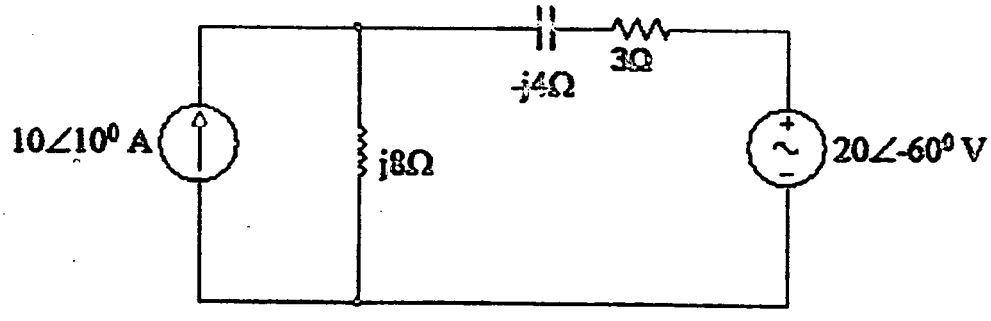
$t << T/2$; $t = T/2$; $t >> T/2$ 6

(ii) In which of the above cases does the circuit act as an integrator? 6

5. (a) Obtain Norton's equivalent of the circuit depicted in figure below: 5



(b) Using Superposition principle, find current in $3-j4\ \Omega$ impedance in the circuit given below: 5



(c) For a load, $V_{rms} = 110\angle 85°$ V, $I_{rms} = 0{\cdot}4\angle 15°$ A. Determine:

(i) the complex and apparent powers

(ii) the real and reactive powers

(iii) the power factor. 5

6. (a) A circuit consisting of a coil with inductance 10 mH and resistance 20 Ω is connected in series with a capacitor and generator with an r.m.s. voltage of 120 V. Find:

(i) the value of capacitance that will cause the circuit to be in resonance at 15 kHz.

(ii) the current through the coil at resonance

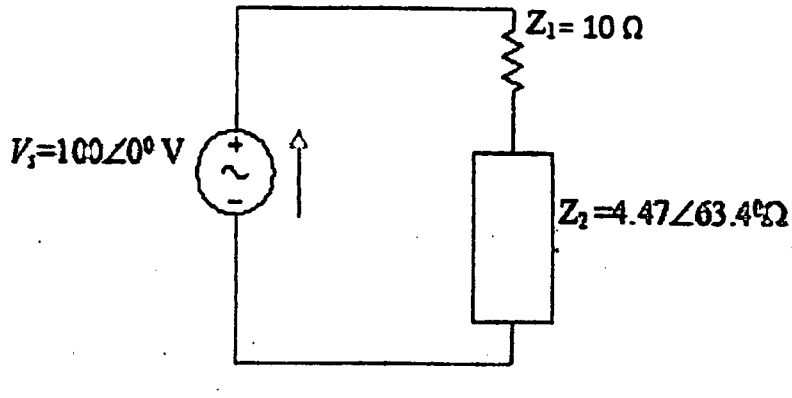
(iii) the Q and bandwidth of the circuit. 5

(b) Design an RC low pass filter that uses $C = 0{\cdot}1\ \mu$F and has cutoff frequency 15 kHz.

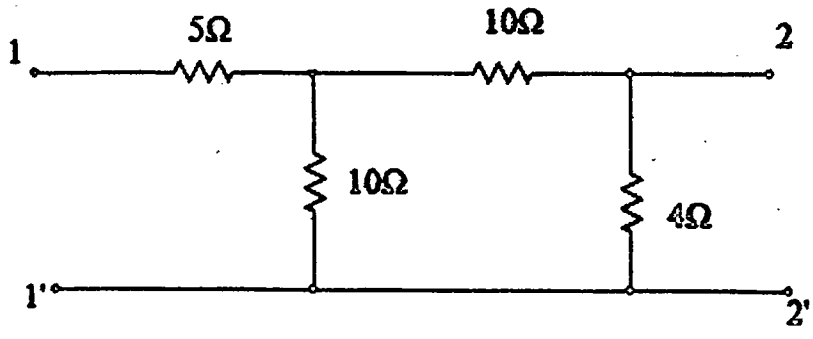
(i) If $V_{in} = 10$ V then find out the output voltage at twice the cutoff frequency

(ii) Determine the frequency at which V_{out} is $0{\cdot}5V_{in}$ 5

(c) The two impedances Z_1 and Z_2 shown below are in series with voltage source $V_s = 100\angle 0°$ V. Find the voltage across each impedance and draw the voltage phasor diagram showing V_s as a resultant of V_1 and V_2. 5



7. (a) Find Z parameters for the network shown in the figure. 6



(b) Derive the expression for *h* parameters from Z parameters. Show that *h* parameter does not exist if Z_{22} is zero. 5

(c) Draw the *h* equivalent for the circuit shown in part (a) after finding the *h* parameters using the expressions derived in part (b). 4