This question paper contains 7 printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **6444**

Unique Paper Code : **251104** **D**

Name of the Paper : **Network Analysis (ELHT-103)**

Name of the 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.

Use of non-programmable scientific calculator is permitted.

1. (*a*) An equivalent circuit has the Norton current 12 $\angle 0°$ A and the Thevenin impedance is 8–6j Ω. What is the maximum average power that can be transferred to the load ?

(*b*) Determine the r.m.s. value of the voltage for the periodic waveform shown in Fig. 1a below :

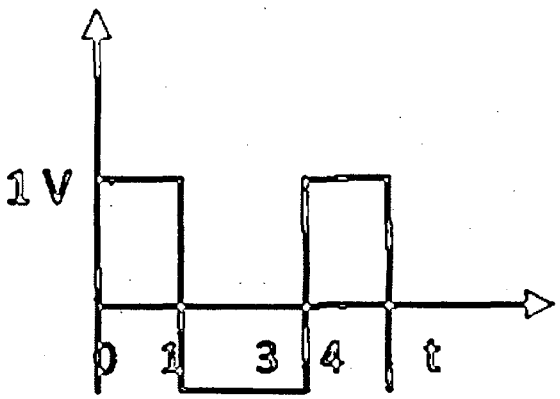

Fig. 1a

P.T.O.

(*c*) In a low pass RC filter with cut-off frequency 1 kHz the capacitor C is replaced by 4C, and now the output is taken across the resistance. What is the cut-off frequency of this filter ? Sketch the frequency response of this system with capacitance of 4C.

(*d*) Draw the Dual Circuit for the given circuit of Fig. 1b.

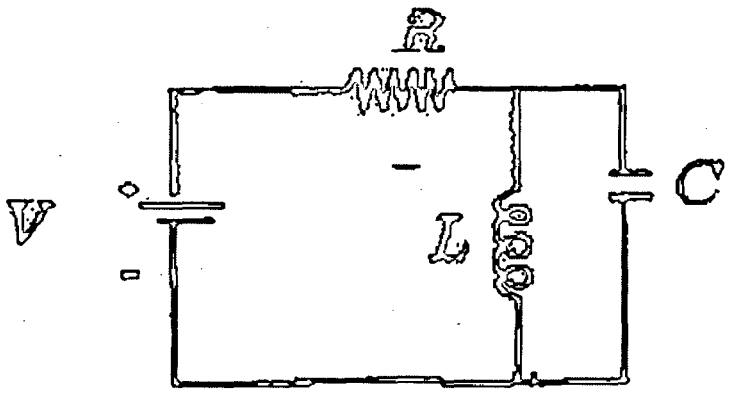

Fig. 1b

(*e*) Define the hybrid parameters for a two-port network. Identify each of these parameters specifically (by name also). 3×5=15

2. (*a*) Loop currents are shown in the network of Fig. 2a. Write the matrix equation and solve for the three currents. 8

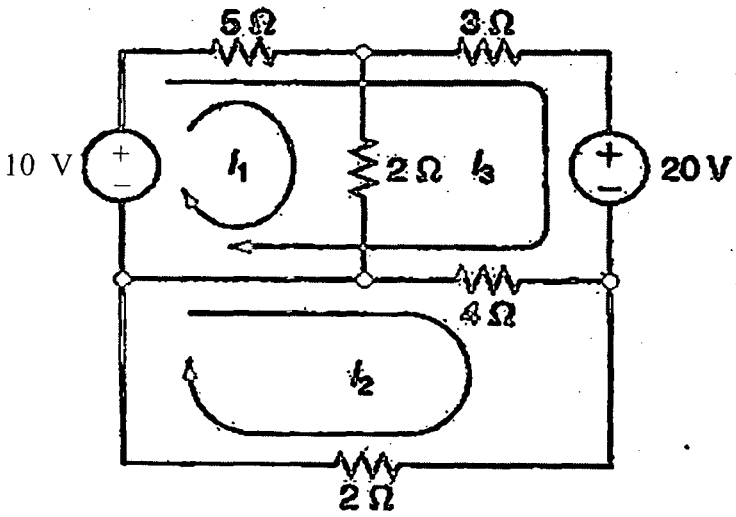

Fig. 2a

(*b*) In the network shown in Fig. 3a, find the current in the 10 Ω resistor. 7

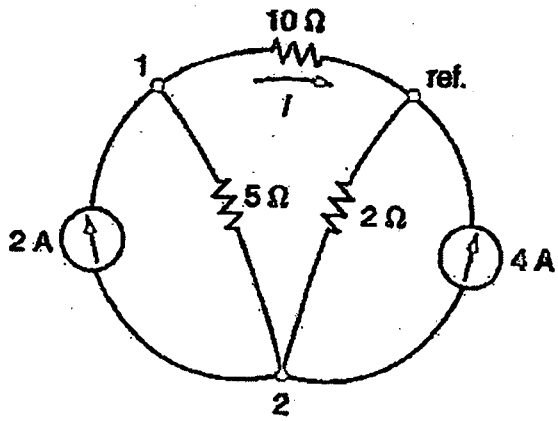

Fig. 2b

3. (*a*) State and prove the Thevenin's theorem. 7

(*b*) For the bridge network in Fig. 3, find R_{ab} and *i*. 8

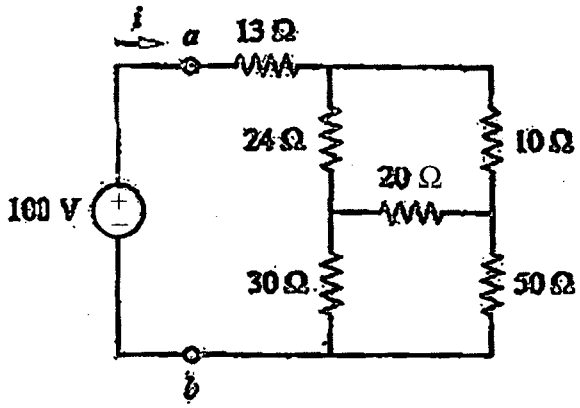

Fig. 3

P.T.O.

4. (*a*) The switch in the circuit shown in Fig. 4a is closed at $t = 0$, at which moment the capacitor has charge $Q_0 = 500\ \mu C$, with the polarity indicated. Obtain i and q, for $t > 0$, and sketch the graph of q. 7

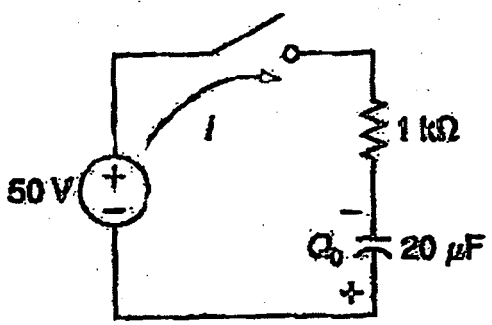

Fig. 4a

(*b*) A series RLC circuit with R = 200 Ω, L = 0.10 H, and C = 1 μF, has an initial charge on the capacitor of $Q_0 = 2.67 \times 10^{-3}$ C. A switch is closed at $t = 0$, allowing the capacitor to discharge. Obtain the current transient. (See Fig. 4b). 8

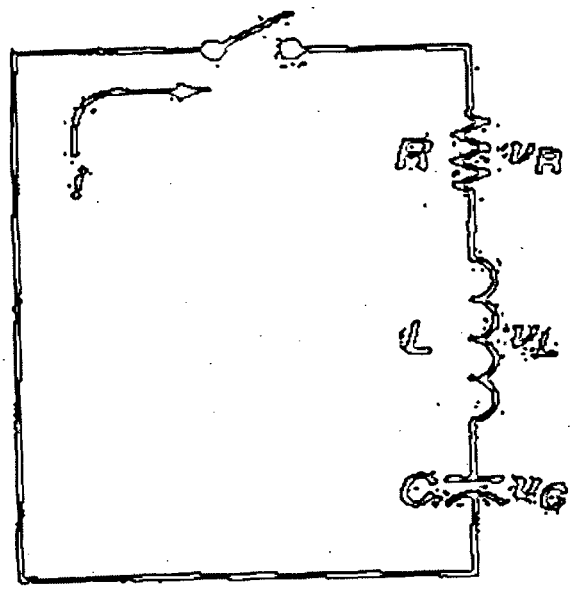

Fig. 4b

5. (*a*) Find the input impedance of the circuit in Fig. 5a. Assume that the circuit operates at $\omega = 50$ rad/s. 7

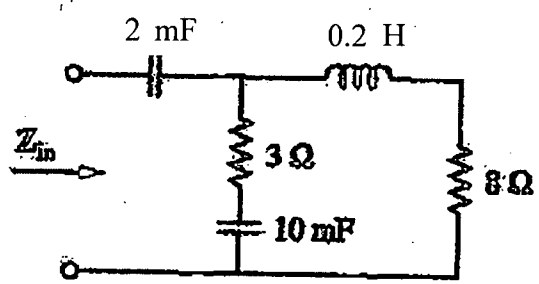

Fig. 5a

(*b*) Replace the active network in Fig. 5b at terminal *ab* with a Norton equivalent. 8

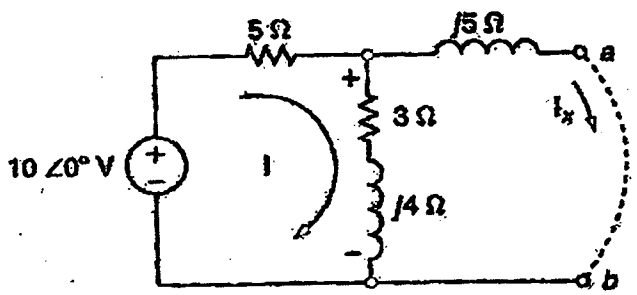

Fig. 5b

6. (*a*) Calculate the power factor of the entire circuit of Fig. 6a as seen by the source. What is the average power applied by the source ? 8

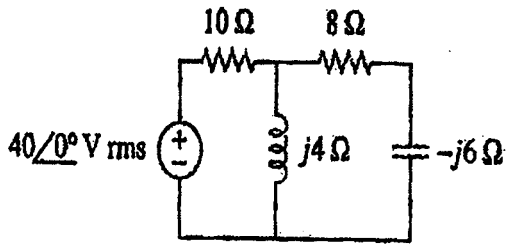

Fig. 6a

(*b*) Obtain the voltage transfer function $H_v(\omega)$ under no load condition for the open circuit shown in Fig. 6b. At what frequency, in hertz, does $|H_v(\omega)| = \frac{1}{\sqrt{2}}$ if C_2 = 10 nF ? 7

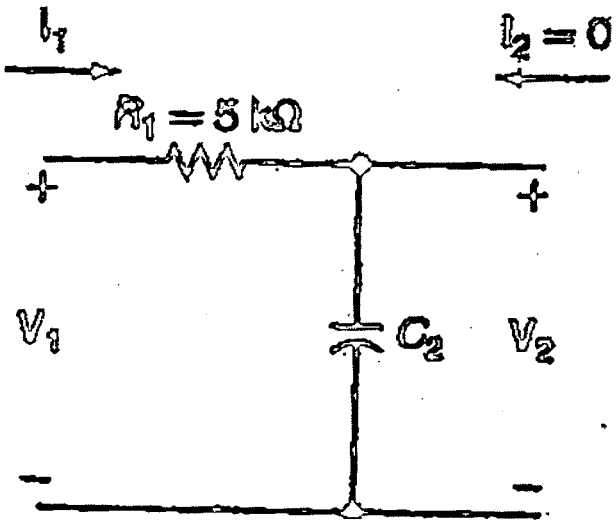

Fig. 6b

7. (*a*) Determine the Z parameters for the two-port network shown in Fig. 7a shown below. 7

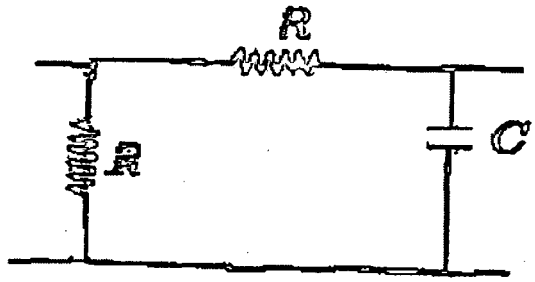

Fig. 7a

(*b*) Identify the condition for a network to be reciprocal in terms of its Z parameters. Given the Y-parameters of a two-port network identify its Z-parameters. 8

$$\begin{pmatrix} 6 & 4 \\ 4 & 7 \end{pmatrix} \Omega^{-1}$$