[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 8733 **C** **Roll No............**

Unique Paper Code : 251104

Name of the Paper : ELHT-103 : Network Analysis

Name of the Course : B.Sc. (Hons.) Electronics – Part I

Duration : 3 Hours

Maximum Marks : 75

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

Instructions for Candidates

Attempt five questions in all. Question No. 1 is compulsory.
Use of Non-programmable Scientific calculators is permitted.

Q1. (a) Obtain the voltage v in the branch shown in Fig.1 for
(i) $i_2 = 1A$, (ii) $i_2 = -2A$, (iii) $i_2 = 0A$

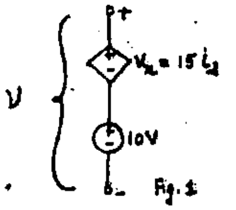

Fig.1

(b) State the Millman's Theorem.

(c) Calculate the energy dissipated in the 5Ω resistor of Fig.2 during the interval $0 < t < 5ms$, if $v_g = 5000t$ (V).

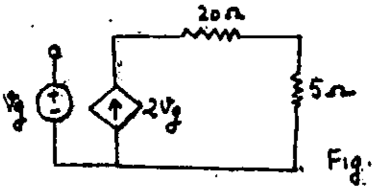

Fig.2

(d) Find the equivalent capacitance seen between terminals a and b of the circuit in Fig.3.

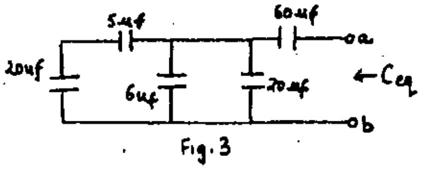

Fig.3

(e) Transform the T network shown in Fig.4 into its equivalent Π network.

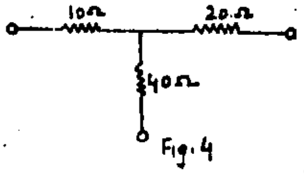

Fig.4

(3x5)

P.T.O.

Q2. (a) A series circuit with R= 2Ω, L = 2mH and C = 500μF has a current which increases linearly from zero to 10A in the interval $0 \leq t \leq 1ms$, remains at 10A for $1ms \leq t \leq 2ms$, and decreases linearly from 10A at t= 2ms to zero at t =3ms. Sketch v_R, v_L and v_C.

(b) (i) Obtain the equivalent resistance for the circuit shown in Fig.5.

(ii) With a constant voltage applied to terminal ab, which resistor absorbs the greatest power?

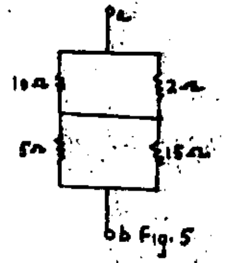

Fig. 5

(c) Explain the principal of Duality. Obtain the dual of the network shown in Fig.6.

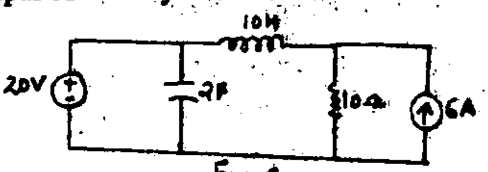

Fig.6

(5, 4, 6)

Q3. (a) State and Prove the Norton's theorem.

(b) Determine Norton's equivalent, for the circuit given in Fig.7, across AB.

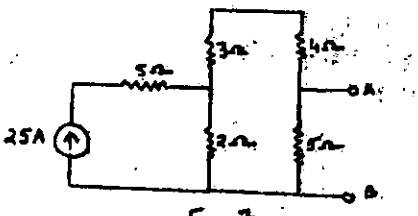

Fig.7

Contd.

(c) Find the maximum power delivered to R_L in Fig.8.

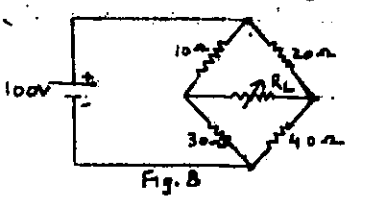

Fig. 8

(5, 5, 5)

Q4. (a) At $t = 0^-$, just before the switch is closed in Fig.9, v_c = 100V. Obtain the current and charge transients. Also obtain the power and energy in the resistor, and compare the latter with the initial energy stored in the capacitor.

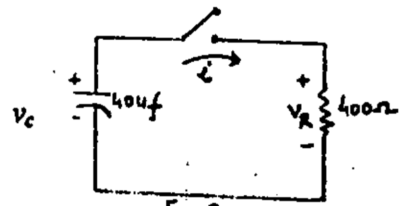

Fig.9.

(b) The switch in the circuit of Fig.10 has been closed for a long time. At t = 0, the switch is opened. Calculate $i(t)$ for t>0.

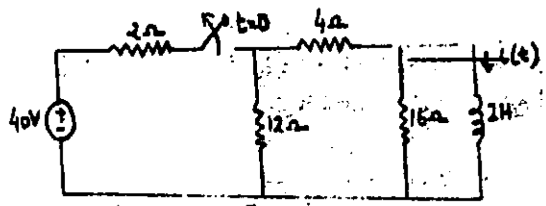

Fig.10

(c) Find $i(t)$ in the circuit in Fig.11. Assume that the circuit has reached steady state at $t = 0^-$.

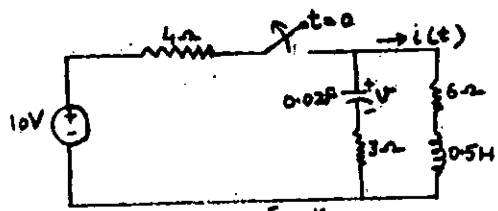

Fig.11

(5, 4, 6)

Q5. (a) In the network of Fig.12, determine the voltage V which results in a zero current through the 2+ j3Ω impedance.

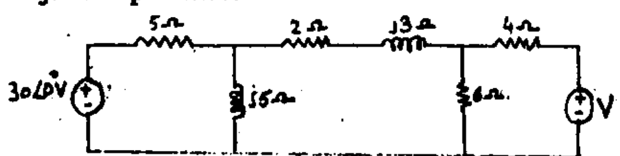

Fig.12

(b) For the network of Fig.13, obtain the Norton's equivalent circuit.

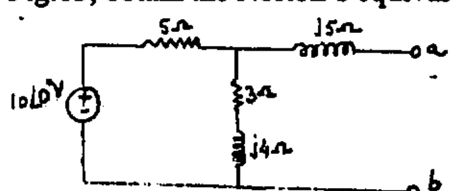

Fig.13

(c) Find the current I_x through the inductor in Fig.14, by first obtaining the transfer impedance. Let $V = 10\angle 30^\circ$ V.

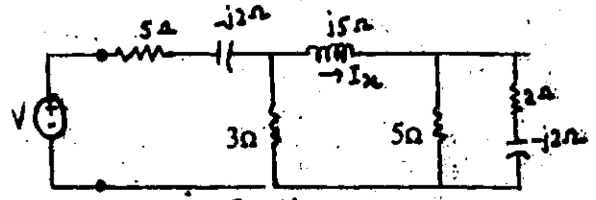

Fig. 14

(5, 5, 5)

Q6. (a) Derive the expression for the Voltage Transfer function, $H_v(\omega)$, of RL High-Pass filter and plot its magnitude.

(b) Find L in the High-Pass circuit shown in Fig.15 if $|H_v(\omega)| = 0.50$ at a frequency of 50 MHz. Also find half-power frequency.

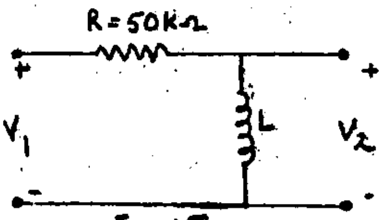

Fig. 15

(c) Find the rms value and the amount of average power dissipated in a 10Ω resistor if the voltage across it is a half-wave rectified sine wave as shown in Fig.16.

Fig. 16

(5, 5, 5)

Q7. (a) Derive the conversion formulae for obtaining the Y parameters from the Z parameters.

(b) Find the Z parameters of the circuit given in Fig.17. Also obtain the Y parameters using the Z parameters

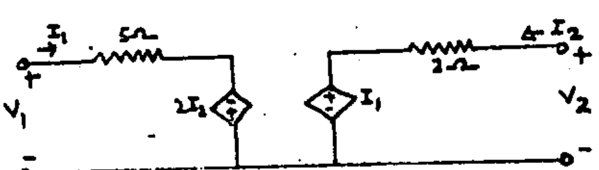

Fig. 17

(c) If the transfer impedances of a two port linear network are equal, what does it indicate? Explain. (4,7,4)