## Subject: NETWORKS AND TRANSMISSION LINES

Time: 3 Hours
NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q. 1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q. 1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.
Q. 1 Choose the correct or the best alternative in the following:
a. Identify the passive element among the following:
(A) Voltage source
(B) Current source
(C) Inductor
(D) Transistor
b. The power dissipation in each of 3 parallel branches is 1 W , what is the total power dissipation of the current?
(A) 1 W
(B) 4 W
(C) 3 W
(D) 0
c. Mesh analysis is based on
(A) Kirchoff's current law
(B) Kirchoff's voltage law
(C) Both
(D) None
d. If a network has B branches, N nodes, then the number of mesh current equations would be
(A) $\mathrm{B}-(\mathrm{N}-1)$
(B) $\mathrm{N}-(\mathrm{B}-1)$
(C) $\mathrm{B}-\mathrm{N}-1$
(D) $(\mathrm{B}+\mathrm{N})-1$
e. Superposition theorem is not valid for
(A) Voltage responses
(B) Current responses
(C) Power responses
(D) All of the above
f. When the superposition theorem is applied to any circuit, the dependent voltage source in the circuit is always
(A) Opened
(B) Shorted
(C) Active
(D) None of the above
g. Thevenin's impedance $\mathrm{Z}_{\mathrm{TH}}$ is found by
(A) short circuiting the given 2 terminals
(B) between any two open terminals
(C) removing voltage sources along with terminal resistances
(D) between same open terminals as $\mathrm{V}_{\text {th }}$
h. The transient response occurs
(A) Only in resistive circuits
(B) Only in inductive circuits
(C) Only in capacitive circuits
(D) Both (B) and (C)
i. Transient current in an RLC circuits is oscillatory when
(A) $\mathrm{R}=2 \sqrt{\frac{\mathrm{~L}}{\mathrm{C}}}$
(B) $\mathrm{R}=0$
(C) $\mathrm{R}>2 \sqrt{\frac{\mathrm{~L}}{\mathrm{C}}}$
(D) $\mathrm{R}<2 \sqrt{\frac{\mathrm{~L}}{\mathrm{C}}}$
j. Which parameters are widely used in transmission line theory?
(A) Z-parameters
(B) Y-parameters
(C)ABCD parameters
(D) H-parameters


## Answer any FIVE Questions out of EIGHT Questions. Each question carries 16 marks.

Q. 2 a. The current in a 3 henry inductor varies as shown in Fig.1. Find the following quantities after the current has flown for two seconds:
(i) flux linkage in the system
(ii) the time rate of change of flux linkages in the system
(iii) the quantity of charge having passed through the inductor.

b. Consider a waveform of voltage given in Fig. 2 applied to an inductor of 2 mH . Obtain the waveforms of current in the inductor. Assume that at $t=0$ the energy and thus current in it to be 0 .

Q. 3 a. A voltage pulse of width $b$ and magnitude 8 volts is applied at time $t=0$ to $a$ series R-C circuit comprising a resistor $R=1 \Omega$ and capacitor $C=\frac{1}{4}$ farad. Find the current $i(t)$. Assume zero charge across the capacitor C before application of voltage pulse.
b. State and prove initial and final value theorems.
Q. 4 a. Consider the network reduce it to a single current source and single resistor network at the terminals 1 and 2. Also find the voltage V across them (Fig.3).

b. State and prove superposition theorem. Also give its significance.
Q. 5 a. Find the y-parameters for the given R.C. ladder network. (Fig.4)

b. Find the transmission parameters for the given R-C network shown in Fig.5.(8)

Q. 6 a. Find the current $\mathrm{i}(\mathrm{t})$ in the network (Fig.6), if the switch is closed at $\mathrm{t}=0$. voltage across capacitor at $\mathrm{t}\left(0^{-}\right)$is 5 V .

b. Draw the phasor diagram and derive the condition for resonance in a parallel RLC circuit shown in Fig.7.


Fig. 7
Q. 7 a. A lossless line of $400 \Omega$ of length 150 cm is exerted by an ac source at 600 MHz frequency. The I voltage minima was observed at a distance of 28 cm from the load. If the VSWR is 2.077 . Find the input impedance and load impedance.
b. The characteristics impedance of a certain line is $710 \mid 14$ and the propagation constant is $0.007+\mathrm{j} 0.028 / \mathrm{km}$. The line is terminated in a $300 \Omega$ resistor. Calculate the input impedance of the line if its length is 100 km .
Q. 8 Write short notes on any TWO of the following:
(i) Quarter wave short circuit line.
(ii) Half wave short circuited line
(iii) Quarter wave open circuited line.
(iv) Half wave open circuited line.
Q. 9 a. Derive equations for phase shift and attenuation constant for constant K LPF and HPF.
b. Design the elements of a symmetrical Bridged T attenuator.

