Subject: NETWORKS AND TRANSMISSION LINES

Time: 3 Hours **JUNE 2011** **Max. Marks: 100**

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: (2×10)

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 1W, what is the total power dissipation of the current?

(A) 1W **(B)** 4W
(C) 3W **(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) B –(N–1) **(B)** N–(B–1)
(C) B–N–1 **(D)** (B+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 Z_{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 V_{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) $R = 2\sqrt{\frac{L}{C}}$
(B) R=0
(C) $R > 2\sqrt{\frac{L}{C}}$
(D) $R < 2\sqrt{\frac{L}{C}}$

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. **(8)**

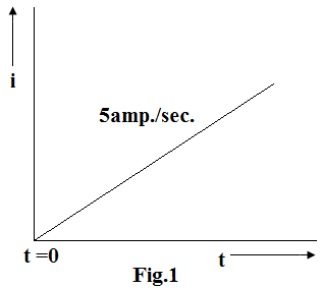

Fig.1

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. **(8)**

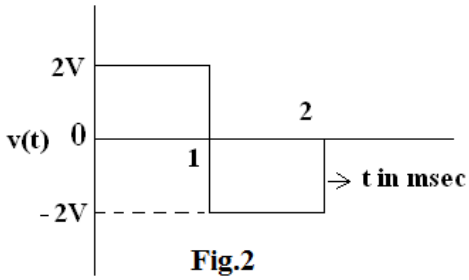

Fig.2

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. **(8)**

b. State and prove initial and final value theorems. **(8)**

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). **(8)**

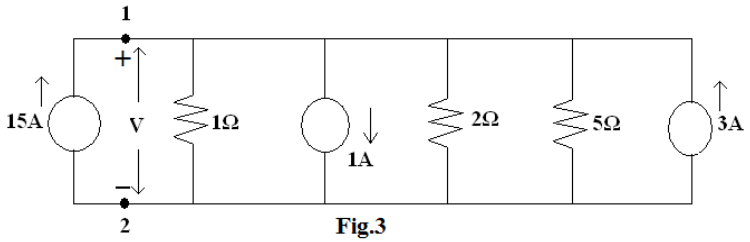

Fig.3

b. State and prove superposition theorem. Also give its significance. **(8)**

Q.5 a. Find the y-parameters for the given R.C. ladder network. (Fig.4) **(8)**

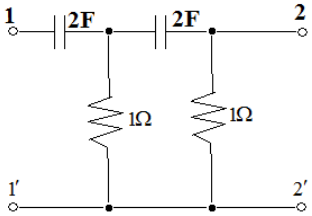

Fig.4

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

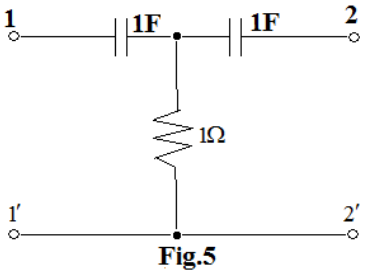

Fig.5

Q.6 a. Find the current i(t) in the network (Fig.6), if the switch is closed at t = 0. The voltage across capacitor at $t(0^-)$ is 5V. **(8)**

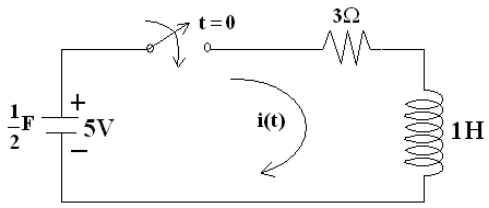

Fig.6

b. Draw the phasor diagram and derive the condition for resonance in a parallel RLC circuit shown in Fig.7. **(8)**

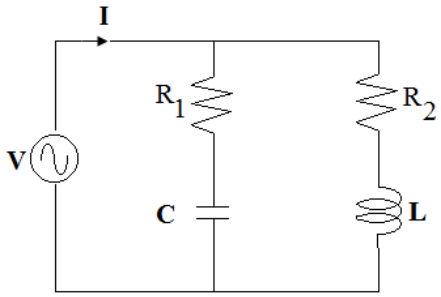

Fig.7

Q.7 a. A lossless line of 400Ω of length 150 cm is exerted by an ac source at 600MHz 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. **(8)**

b. The characteristics impedance of a certain line is $710\angle 14$ and the propagation constant is 0.007+j0.028/km. The line is terminated in a 300Ω resistor. Calculate the input impedance of the line if its length is 100 km. **(8)**

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. **(8+8)**

Q.9 a. Derive equations for phase shift and attenuation constant for constant K LPF and HPF. **(8)**

b. Design the elements of a symmetrical Bridged T attenuator. **(8)**