Code: DE07 **Subject: NETWORK AND TRANSMISSION LI**
Time: 3 Hours **Max. Marks: 10**

JUNE 2011

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. In a parallel RLC circuit, if X_L = 1000 ohm, and R = 10 ohm, then the value of Q factor will be

(A) 1 **(B)** 10
(C) 200 **(D)** 100

b. The poles and zeros of a driving-point function of a network are simple and interlace on the negative real axis with a pole closest to the origin. It can be realized

(A) By an LC network
(B) As an RC driving-point impedance
(C) As an RC driving-point admittance
(D) Only by an RLC network

c. In the network shown in Fig. 1, the switch 'S' is closed and a steady state is attained. If the switch is opened at t = 0, then the current i (t) through the inductor will be

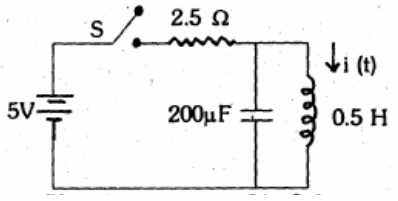

Fig. 1

(A) cos 50 t A **(B)** 2A
(C) 2 cos 100 t A **(D)** 2 sin 50 t A

d. Two impedances Z_1= a+jb and Z_2= c-jd are connected in series .The condition for resonance is

(A) b=d **(B)** d= –b
(C) bd=0 **(D)** 2 bd

e. A two port network is reciprocal if and only if:

(A) $Z_{11} = Z_{22}$ **(B)** BC – AD = –1
(C) $Y_{12} = -Y_{21}$ **(D)** $h_{12} = h_{21}$

f. An RC circuit has a capacitor C = 2 μF in series with a resistance R=1MΩ. The time of 6 sec will be equal to

(A) One time constant **(B)** two time constant
(C) three time constant **(D)** none of these

g. The principles of homogeneity and superposition are applied to

(A) Linear time variant system
(B) Non-Linear time variant system
(C) Linear time invariant system
(D) non-Linear time invariant system

h. Insertion losses occur in

(A) Resonance circuits **(B)** Transmission lines
(C) Transient networks **(D)** None of above

i. For maximum power to be transferred the load resistance is equal to

(A) voltage source **(B)** current source
(C) internal resistance of source **(D)** voltage and current source both

j. A band stop filter is obtained by

(A) parallel connection of low pass filter and high pass filter
(B) series connection of low pass filter and high pass filter
(C) parallel connection of two low pass filter
(D) parallel connection of two high pass filter

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

Q.2 a. The current in a conductor varies according to the equation $=3e^{-t}$ A. for t greater than zero and is zero for t less than zero. Find the total charge in coloumb that passes through conductor. **(4)**

b. What are the various energy sources? Explain with suitable diagram. **(4)**

c. Explain various network elements with suitable example.

Q.3 a. State superposition theorem. With the help of superposition theorem, obtain the value of current I and voltage V_o in the circuit shown in Fig2. **(2+3+3)**

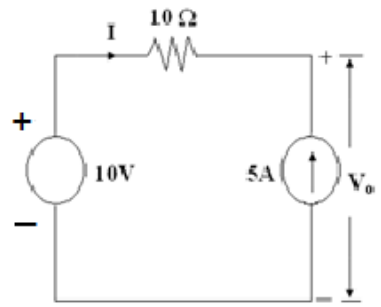

Fig.2

b. State and prove Maximum Power transfer theorem. Give applications of Thevenin's theorem and superposition theorem. **(4+2+2)**

Q.4 a. Given the function $F(s) = \frac{2(s+1)}{s^2+2s+5}$. Find the initial value of $f(0^+)$ of the corresponding time function f(t). **(8)**

b. A pulse voltage of width 'a' and magnitude10Volts is applied at time t=0 to series R-L circuit consisting of resistance R=4 Ω and inductor L= 2 henrys. Find the current i(t). Assume zero current through the inductor L before application of voltage pulse. **(8)**

Q.5 a. The y – parameters of a two-port network are y_{11}=0.4s; y_{22}=0.2s; $y_{12}=y_{21}$ = −0.1s. Compute the transmission parameters of the network and write the equilibrium equations for the network using these two types of parameters.

(4+2+2)

b. Find the short circuit admittance functions y_{11} and y_{21} for the network in Fig 3. **(8)**

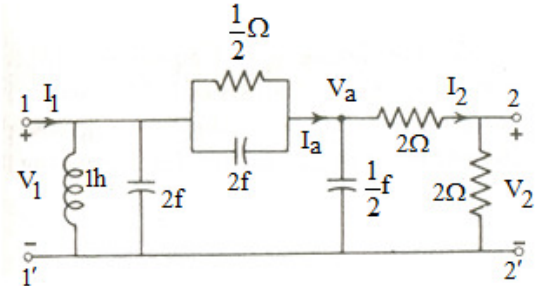

Fig.3

Q.6 a. A series circuit consists of resistances R=25Ω and inductance L= 0.01 henrys and capacitance C= 0.04μF. Calculate the frequency of resonance. If a 10 Volts source of frequency equal to the frequency of resonance is applied to this circuit, calculate the values of voltages V_c and V_ℓ across C and L respectively. Find the frequencies at which these voltages V_c and V_ℓ are maximum. **(8)**

b. A circuit consisting of a capacitor in parallel with a coil whose inductance & resistance are 1.05 mH and 100 Ω respectively, is driven at its resonant frequency of 600 kHz from a constant-current source. The source consists of a 2.3 mA, 600 kHz constant current generator in parallel with a 60 k Ω resistance. Find
(i) Q of the coil
(ii) Capacitance, C
(iii) Q of the circuit
(iv) bandwidth of the circuit
(v) maximum energy stored in the capacitor
(vi) power dissipated in the resistor **(1+1+1+1+2+2)**

Q.7 a. The values of primary constants of an open wire line per km are R=10Ω and inductance L= 3.5mH and capacitance C= 0.008μF, G= 0.7 mho. For f = 1 KHz, find **(2+2+1+1+1+1)**
(i) Characteristics impedance Z_o
(ii) Propagation constant
(iii) Attenuation constant α
(iv) Phase constant β
(v) Wavelength
(vi) Phase velocity

b. What is voltage standing wave ratio? Write its significance. **(4+4)**

Q.8 a An attenuator is composed of symmetrical π-section having series arm of 200 Ω and shunt arm each of 400 Ω. Derive expression and calculate **(4+4)**
(i) The characteristic impedance of this network
(ii) Attenuation per section

b. Describe the following terms:

(i) Low pass filters
(ii) High pass filters
(iii) Band pass filters
(iv) Pass band

(4×2)

Q.9 a. Synthesise the Cauer–I form of given admittance function
$Y(s)=(s^2 + 1)(s^2+ 5)/s(s^2+3)$

b. Determine i(0+), di/dt(0+), and d^2i/dt^2 (0+) for the circuit given in Fig.4 if V=10 V, R= 10 Ω, L = 1 H, C= 10μF and $V_c(0) = 0$. **(8+8)**

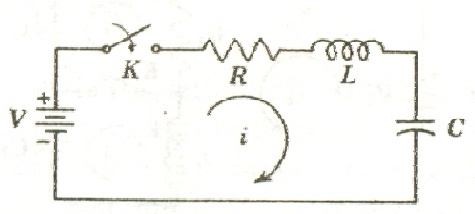

Fig.4