Roll No. .....

Total No. of Questions : 09] [Total No. of Pages : 03

B. Tech. (Sem. - 3rd)

NETWORK ANALYSIS AND SYNTHESIS

SUBJECT CODE : EE - 201

Paper ID : [A0305]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 × 2 = 20)*

a) What is objective of using Network Theorems?

b) Name circuit elements of an a.c. network and classify them as passive elements and active elements.

c) Are network theorems applicable to a.c. networks also or their applications restricted to d.c. networks only.

d) An R-L series circuit of R = 10Ω and L = 1H is connected across a d.c. voltage of 100V. What is amplitude of current flowing in the circuit?

e) What is advantage of using Laplace transform in analysis of electrical networks?

f) The unit of energy commonly used by electric utility is kwh. How many joules are there in 1 kwh?

g) Time constant of an R-L circuit is given by $\frac{L}{R}$. Show that the unit of $\frac{L}{R}$ is second.

h) Define network functions. Is transfer function also a network function. If TF = Z(s), identify input and output function corresponding to above T.F.

i) Give classification of Filters.

j) A two terminal pair network (TTPN) is shown in Fig. 1, show if the given network is

(i) reciprocal (ii) symmetrical and (iii) balanced.

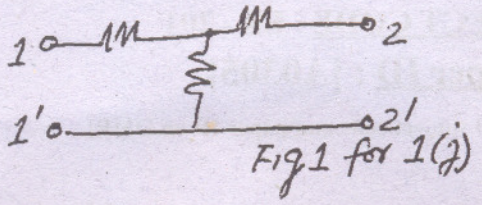

Fig 1 for 1(j)

Section - B

(4 × 5 = 20)

Q2) State and explain Thevenin's theorem. For the network shown in Fig. 2, sketch Thevenin's equivalent at b-b′ and obtain current in load resistance, $R_L = 2\Omega$

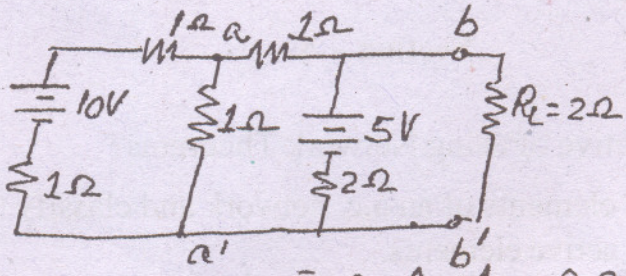

Fig 2 A network for Q. 2

Q3) Discuss transient and steady state response in case of an R-L series circuit energized by a d.c. voltage source, Evolt. A 12V d.c. voltage source is disconnected in Fig. 2 at t = 0. Show the wave shape of inductor current (*i*) and the voltage (v) across inductor for all times.

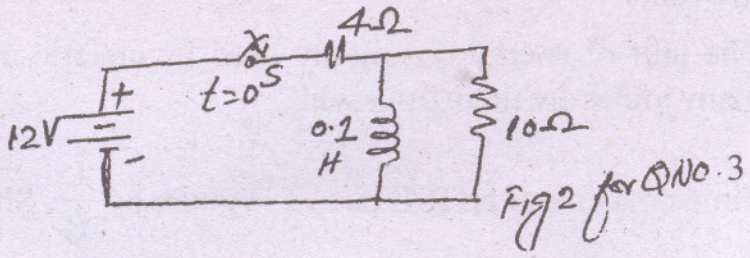

Fig 2 for Q No. 3

Q4) Define poles and zeroes of a network function. Show pole-zero configuration for the transfer admittance function

$$H(s) = \left(\frac{s^2 + 2s + 17}{s^2 + 3s + 2} \right).$$

Use geometrical method to evaluate the T.F. at the test point (j 10).

Q5) State and prove Convolution Theorem. How is convolution integral evaluated - discuss. Consider two functions $f_1(t)$ and $f_2(t)$ given by

$$f_1(t) = 1 \ , \ 0 < t < 1$$
$$= 0, \text{ otherwise}$$

$$f_2(t) = \frac{1}{R}\left(1 - e^{-\frac{R}{L}t}\right), t \geq 0$$

obtain $f_1(t) * f_2(t)$.

Q6) A two terminal network consists of a coil having an inductance, L and resistance R shunted by a capacitor C. The poles and zeroes of the driving point impedance function of this network are given by

$$p_1 \text{ and } p_2 = -\frac{1}{2} \pm j\sqrt{3}/2 \text{ , zero } z_1 = -1$$

If $Z(s)|_{s=j0} = -1$, determine R, L & C.

Section - C

(2 × 10 = 20)

Q7) (a) How is a physical network realised by considering the driving point admittance function-discuss.

(b) Determine the Foster and Cauer form of realization if the driving - point impedance function Z(s) is given by

$$Z(s) = \frac{4(s^2+1)(s^2+9)}{s(s^2+4)}.$$

Q8) (a) Derive expressions for (i) characteristic impedance and (ii) propagation constant of a pure reactive network.

(b) Discuss how can a constant k - low pass filter be designed. Design a constant k - type band pass filter section to be terminated in 600 Ω resistance having cut off frequencies of 2kHz and 5kHz.

Q9) Write short notes on :

(a) Composite Filters and

(b) On time domain behaviours from poles and zeroes.