Registration No. :

Total number of printed pages – 3

Third Semester Regular Examination – 2014

NETWORK THEORY

BRANCH(S) : AEIE, CSE, EC, EEE, ELECTRICAL, ETC, IEE, IT

QUESTION CODE : H 404

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2 ×10

    (a) Explain what is meant by duality. Give the requirement for the network
         to be dual of other.

    (b) Define lumped and distributed elements of a network.

    (c) Prove that efficiency under maximum power transfer condition is 50 %.

    (d) Express fourier series in exponential form and give fundamental harmonics
         term in fourier series.

    (e) What is the significance of time constant of R-L circuit ?

    (f) What information do poles and zeros provide in respect of network to which
         they relate ?

    (g) For the network shown in the following fig, convert the voltage source into
         current source.
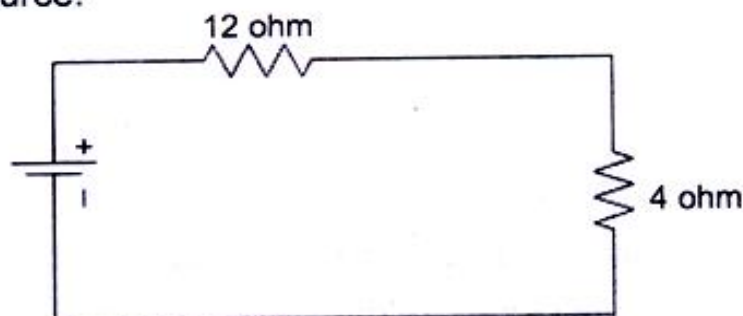
(h) A coil of resistance 2ohm and inductance 0.01H is connected in series with capacitor C. If maximum current occurs at 25Hz find C ?

(i) Write 2 properties of Laplace transformations.

(j) Write the steps to be involved in the determination of initial conditions.

2. (a) Two generators with emfs 200 and 250 V and armature resistance of 2Ω and 1Ω respectively are in parallel supplying a load resistance of 10Ω. Find 6

   (a) current Supplied by each generator

   (b) load current and

   (c) load voltage.

   Use super Position theorem

   (b) Explain with relevant diagram, Voltage division and current division rule. 4

3. A series RLC circuit consists of R=100 ohm, L = 0.02 H and C = 0.02 microfarad. Calculate frequency of resonance. A variable frequency sinusoidal voltage of constant RMS value of 50V is applied to the circuit. Find the frequency at which voltage across L and C is maximum. Also calculate voltage across L and C is maximum. Also calculate voltages across L and C at frequency of resonance. Find maximum current in the circuit. 10
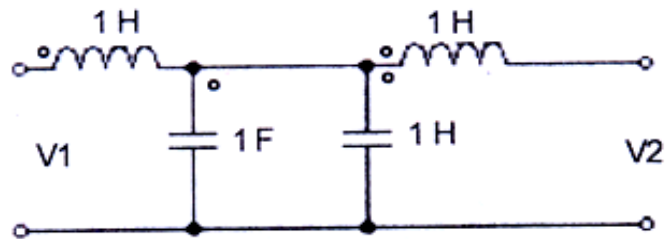
4. (a) Determine the Fourier series of the wave shown in fig. 5
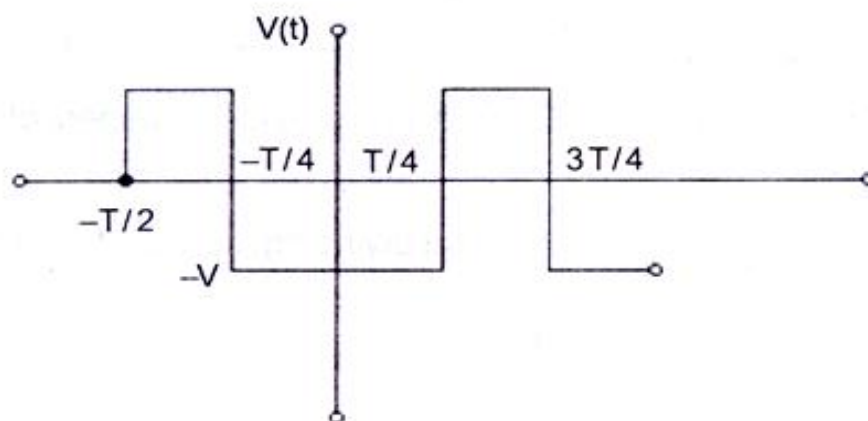
(b) Find out the initial and final value of $(s+b)/s(s+a)$. 5

5. (a) What is the maximum possible mutual inductance of two inductively coupled coils with self inductance L1=25mH and L2=100mH ? 4

(b)   Find the transfer functions Z12(S) and G12(S) for the network shown in fig.

6

6.   (a)   A series RLC circuit has Q = 75 and a pass band (between half power Frequencies) of 160 Hz. Calculate the resonant frequency and the upper and lower frequencies of the pass band.

6

   (b)   What are the various types of interconnections possible in 2 port network ?

4

7.   (a)   For the network shown find G12(S).Write the results in the form of polynomials in S to decide poles and zeros.

5
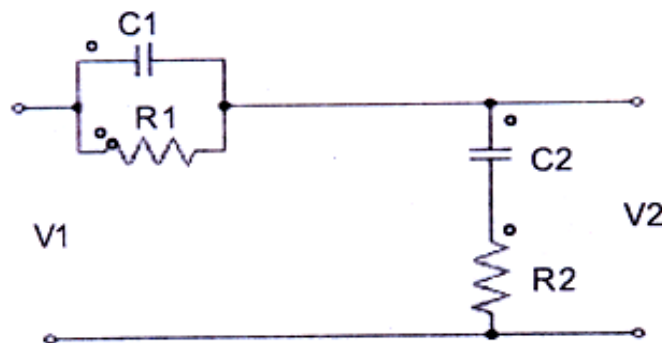
   (b)   Check the positive realness of the following function :

5

$$z(s) = \frac{s^2 + s + 6}{s^2 + s + 1}$$

8.   Write short notes on any two of the following :

5×2

   (a)   Cut-set matrix

   (b)   Final value theorem

   (c)   Resonance and Q factor.