Registration No. : | | | | | | | | | | |

Total number of printed pages – 4

B. Tech

CPES 5201

Special Examination – 2012

NETWORK THEORY

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) Write down two properties cut set ?

(b) State Maximum power transfer Theorem ?

(c) What do you mean by mutual inductance ? Explain.

(d) Write down the relation between links and twigs.

(e) Why a step signal is preferred input for study of transient response ?

(f) Discuss two utilities of fourier series in network theory.

(g) The transmission parameter equation of a two port device is defined by the following pair of equations :

$V_1 = 5V_2 - 2I_2$, $I_1 = 4V_2 - 3I_2$.

Write its impedances parameter Z_{11}, Z_{12}.Z_{21}, Z_{22}.

(h) Draw the circuit for a second order active low pass filter.

(i) Write down two applications of active filter ?

(j) Check whether $F(s) = \dfrac{2S^2 + S + 1}{S^2 + 2S + 1}$ is a positive real function.

P.T.O.

2. (a) What do you understand by dot convention for representing the mutually coupled coils ? Explain in brief by drawing a circuit showing dot convention. 5

(b) For the network shown in Fig 2 (b), draw the oriented graph and obtain the tie set matrix. Also use this matrix to calculate the current i. 5

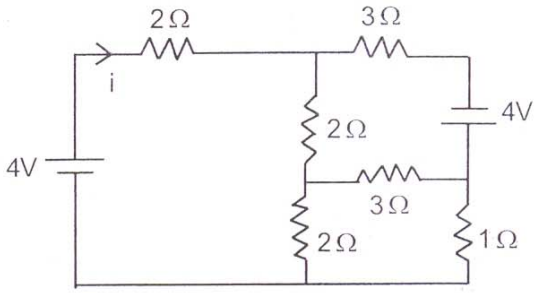

Fig 2(b)

3. (a) Verify the Reciprocity Theorem for the network shown below in Fig 3(a). Using current source as shown and v_1 is the voltmeter reading. 5

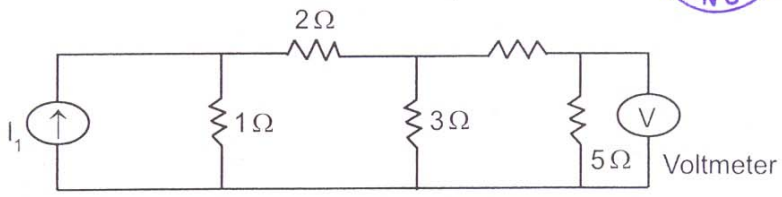

Fig 3(a)

(b) A current source, having an internal resistance of 5kΩ feeds a tank circuit containing a coil having L= 200 mH and R= 20 Ω in parallel to a capacitor of 200 μ F. Find the frequency of resonance and Q factor. 5

4. (a) Determine the complex frequency S of each term : 5

(i) $v(t) = 8 + 2\cos t$ mV

(ii) $v(t) = 65e^{-1000t}\cos 1000t$ V

(iii) $q(t) = 7e^{-5t}$ C

(iv) $q(t) = 7e^{-5t} - 19e^{-5t}\sin(8t - 42°)$ C

(b) In the network shown Fig 4(b) the switch is closed and a steady state is reached in the network. At time t = 0 the switch is opened .Find the expression for the current through the inductor $i_2(t)$? 5

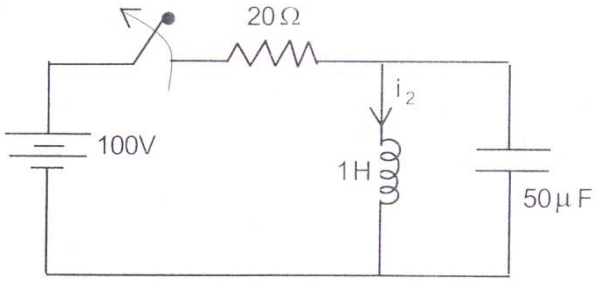

Fig 4(b)

5. (a) Determine the fourier series expansion of the function for the wave form shown below n Fig 5(a). 5

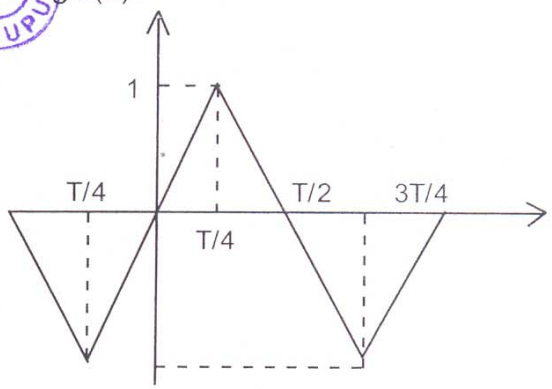

Fig 5(a)

(b) Obtain the fourier coeffecients for the function given by $f(t) = (t + \pi)$ when $-\pi < t < \pi$; $f(x + 2\pi) = f(x)$. 5

6. (a) Determine the Z parameter for the bridged T network shown in Fig 6 (a) below. 5

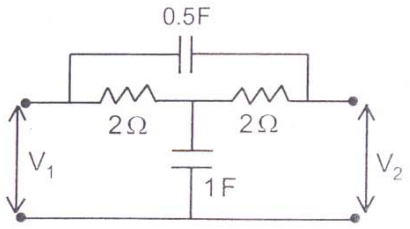

Fig 6(a)

(b) What are the limitations on pole and zero locations in transfer function ? 5

7. (a) Design a constant k high pass filter having a cut off frequency of 1500 Hz. The resistance of the load circuit is $600\,\Omega$. Determine the values of components required ? 5

(b) Synthesize the impedance function $Z(s) = \frac{S(S^2+3)(S^2+5)}{(S^2+2)(S^2+4)}$ Using Cauer II form ? 5

8. Write short notes on any **two** : 5×2

(a) Band width and Selectivity

(b) Milliman's Theorem

(c) Final value theorem