[06 – 3217]

III/IV B.E. DEGREE EXAMINATION.

Second Semester

Electrical and Electronics Engineering

ADVANCED NETWORK THEORY

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Question 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

1. (a) State convolution theorem.

   (b) How is the location of zeros and poles in s-plane related to network response in time domain?

   (c) What is scaling of network function?

   (d) Explain computation of residues.

   (e) Explain elementary network synthesis operations.

   (f) What is minimum Positive Real Function (PRF)?

   (g) Is the following polynomial Hurwitz?

   $$F(s) = s^5 + 8s^4 + 24s^3 + 8s^2 + 23s + 6.$$

6. An impedance function is given by $Z(s) = \frac{8(s^2+1)(s^2+3)}{s(s^2+2)(s^2+3)}$ Realise the network in Foster-I and Cauer-II forms.

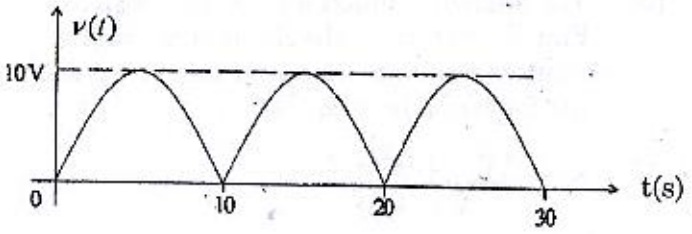
7. (a) Explain Brune's method of RLC synthesis.

   (b) Find the Brune's network realisation of the impedance function :

$$Z(s) = \frac{5s^2 + 18s^2 + 8}{s^2 + s + 10}$$

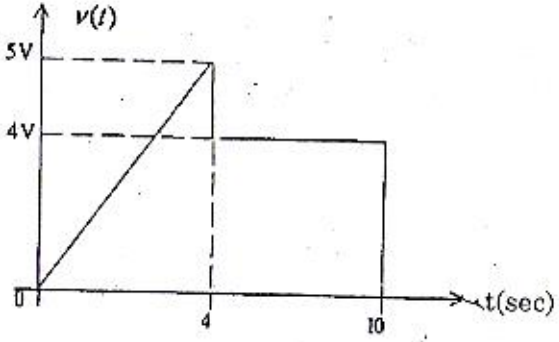
8. (a) Discuss the properties of RL and RC admittance functions.

   (b) Determine the Fourier series of the output voltage of a full wave rectifier shown in the figure below :



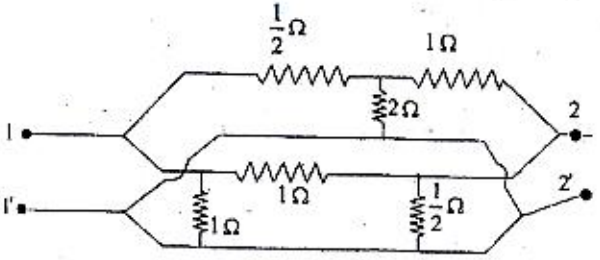
2. (a) Define Laplace transform and Fourier transform. Derive the relationship between them.

(b) Synthesize the voltage wave form given below in time domain and find its Laplace transform.



3. (a) Define and explain open circuit and short circuit network functions of a 2-port network.

(b) Obtain the Y-parameters for the following circuit.



4. (a) Show that the Fourier Transform of an impulse train in time is an impulse train in frequency.

(b) An R-L series circuit is excited by a unit ramp voltage of $V(t) = t$. If $R = 1\Omega$, $L = 1H$, determine the response.

(i) by using convolution of input and impulse response and

(ii) By direct method.

5. (a) What are Hurwitz polynomials? List out their properties and mention how polynomials are tested for Hurwitz character.

(b) The following functions are not positive real. Find out which of the necessary conditions of positive realness is not satisfied by each of the following functions.

(i) $\dfrac{(s^2+1)(s^2+2)}{s(s^2+3)}$

(ii) $\dfrac{s^3+s^2+2s+1}{s+4}$

(iii) $\dfrac{s^2+2s+1}{s^2}$

(iv) $\dfrac{s^3+7s^2+15s+9}{s^4+6s^2+9}$