Roll No. 1700100808 Total Pages : 6

305303

Dec., 2018

B.Tech., IIIrd Semester

NETWORK THEORY

(EC-304)

Time : 3 Hours] [Max. Marks : 75

Instructions :

(i) It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.

(ii) Answer any four questions from Part-B in detail.

(iii) Different sub-parts of a question are to be attempted adjacent to each other.

PART–A

1. (a) State superposition theorem and also write its limitations. (1.5)

   (b) What is the difference between Laplace transform and Fourier transform? (1.5)

   (c) Why is spectrum of Fourier transform continuous in comparison to Fourier series? (1.5)

(d) A coil having resistance 5 Ω and inductance 0.25 H is connected in series with variable capacitor across 200 V, 50 Hz. Calculate the capacitance of condenser required to produce resonance and find corresponding values of (i) Current (ii) voltage across coil and capacitor and (iii) Power factor. (1.5)

(e) Discuss the importance of singularity functions. (1.5)

(f) What are the advantages of m-derived filter over a constant K filter? (1.5)

(g) Write the restrictions on the locations of poles and zeros for transfer function. (1.5)

(h) Define the following terms: (i) Effective value (ii) Power factor and (iii) Duality. (1.5)

(i) Synthesize a single half sine waveform as shown in Fig. 1.

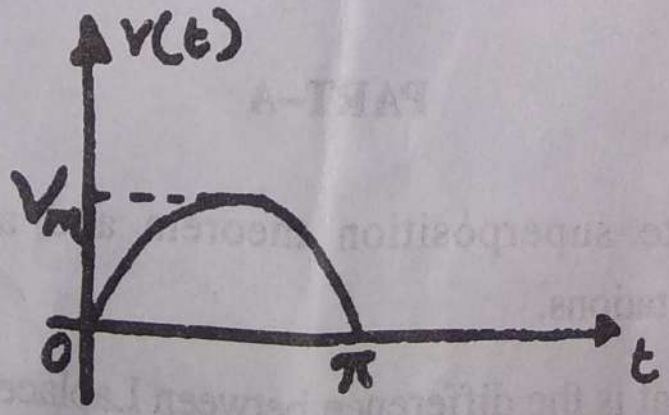

Fig. 1. (1.5)

(j) What is the concept of complex frequency? (1.5)

PART–B

2. (a) Determine loop currents of the network as shown in Fig. 2(a) based on matrix approach using mesh analysis. Also find the voltage across the capacitor. (8)

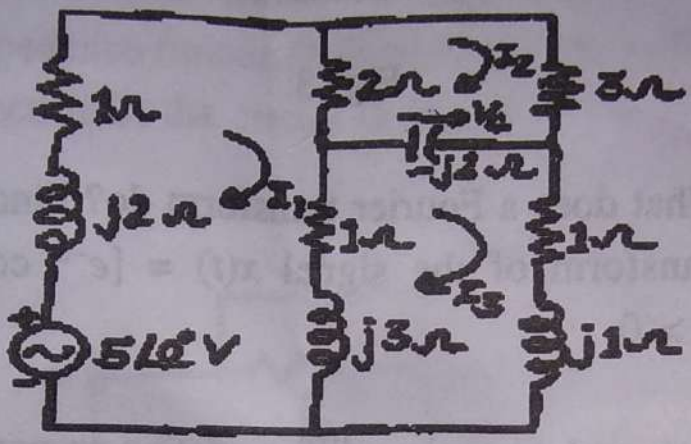

Fig. 2(a).

(b) What is the effect of symmetry for a periodic function to determine the trigonometric Fourier series coefficients? Obtain the Fourier series for the waveform as shown in Fig. 2(b). (7)

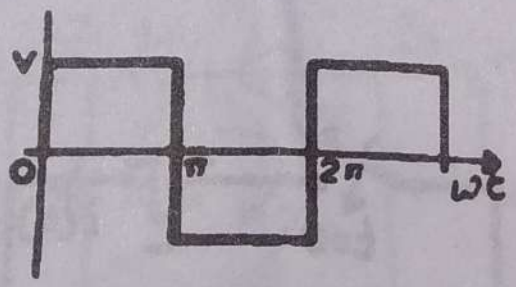

Fig. 2(b).

3. (a) State Tellegen's theorem and verify it for the network shown in Fig. 3. (8)

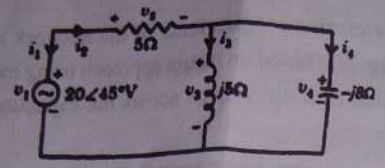

Fig. 3.

(b) What does a Fourier transform do? Find the Fourier transform of the signal $x(t) = [e^{-\alpha} \cos W_0 t]\ U(t)$; $\alpha > 0$. (7)

4. (a) State and prove time differentiation property of Laplace transform. Also obtain Laplace transform of the function $\sin \omega t\ U(t - t_0)$. (8)

(b) In the circuit of Fig. 4, L = 2 H, R = 12 Ω and C = 62.5 mF. The initial conditions are $v_c(0^+) = 100$ V and $i_L(0^+) = 1.0$ A. The switch is closed at $t = 0$. Find $i(t)$ using Laplace transform and partial fraction expansion. (7)

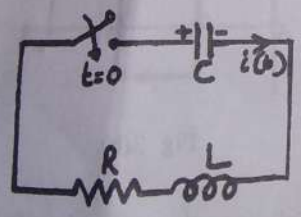

Fig. 4.

5. (a) Plot the poles and zeros of $H(s) = \dfrac{4s}{(s+2)(s^2+2s+2)}$ and use it to find $h(t)$ and also the magnitude and phase response of $H(jw)$ for $w = 1$. (8)

(b) Differentiate transform impedance and transfer impedance functions. Find $Z_{in}(s)$ and voltage transfer function in the circuit of Fig. 5. (7)

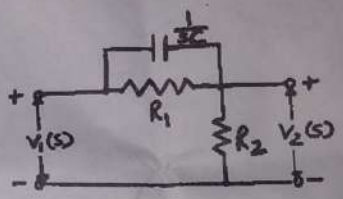

Fig. 5.

6. (a) Find the Z, Y and transmission parameters for the network of Fig. 6.

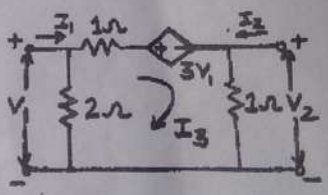

Fig. 6. (8)

(b) Derive the condition for series -parallel interconnection of two 2-port network. (7)

7. (a) What are the parameters of filter? Explain about various types of filters.

(b) Design constant k low pass T and π section filters to be terminated in 600 Ω, having cut-off frequency 3 kHz. Determine (i) the frequency at which filters offer attenuation of 17.372 dB (ii) the characteristic impedance and phase constant at 2 kHz.
