Department of Electronics & Communication Engineering

Question Bank

BTEC-304-18 (Network Theory) 3rd Semester

TWO MARKS OUSTIONS:

1. Differentiate between active and passive filters.
2. Mention the various applications of filters.
3. Draw the ideal characteristics of low pass, high pass, band pass, band elimination filters.
4. What *do* you mean by Network synthesis? How this different is from network analysis.
5. Discuss the short coming of constant K filter section.
6. State any two properties of Laplace transform.
7. How do you classify various filters?
8. Discuss the merits and demerits of digital over analog filters.
9. Explain the terms: Cut set and Cut set matrix.
10. Explain the applications of graph theory.
11. Explain where we use attenuators.
12. Define active and passive circuit elements.
13. Find the Laplace transforms of the function: sin3t, tsin2t.
14. Write few applications of Laplace transforms.
15. Compare ideal and practical voltage and current sources.
16. Write the basic circuit elements and their duals.
17. Define Tree and Rank of a graph.
18. What are unit function, unit ramp function, unit impulse function <fe unit doublet function?
19. Define Resonant frequency.
20. What are shifter functions & State gate function.
21. What are poles and zeros?
22. What is a transfer function? Write necessary conditions for transfer functions.
23. Explain Routh criteria.
24. Write names of different types of filters.
25. Write basic equations representing transmission parameters.
26. Which parameters are preferred for cascade connected networks? And why?
27. Define eigenvalues and state vector.
28. What is the application of Reciprocity theorem?
29. Distinguish between a voltage source and current source.
30. What is driving point impedance?
31. List merits and demerits of Laplace transform.
32. What do poles signify?
33. Distinguish between Network analysis and synthesis.
34. What is the concept of duality?
35. What are composite filters ?
36. Define the tern time constant.
37. What is the significance of an impulse function?
38. Write necessary conditions for a function to be positive real function.
39. Why we synthesize the network?
40. State and prove reciprocity theorem.

41. State *and* prove convolution theorem.
42. What are values of inductances and capacitances in *m* derived band stop filters.
43. What are the conditions for characteristic impedances in the pass and stop bands?
44. The values of ramp function at t=S is quoted as .....
45. Among resistor, inductor and transistor which is non-Jinear device?
46. What is the lag/lead phase relation between voltage across R and Xi. when the two are in series?
47. In terms of ABCD parameters when is a two-port network symmetrical?
48. Write the Fourier transforms *F(jw*) of an even function fft).
49. . Write the expression of function f(t) shifted by 'a'.
50'. When the network N' a dual network N?
51. When is a network said to be linear?
52. What is the number of different node pair voltage in a network that has 10 nodes and 17 branches?
53. What is the value of a unit impulse function.
54. Give *h* and I_P for a transformer with a 20:1 voltage step down ratio and has 6 V across 0.6 ohms in secondary.
55. What is the phase difference between applied voltage and current in a circuit having 90 ohms resistance in series with 90 ohms capacitive reactance?
56. Thevnin's theorem can be applied to calculate current in what type of load?
57. What is the number of independent loops in a network containing a conventional transformer and 8 elements with 5 nodes?
58. Write the integral representing the convolution of two functions f i(i) and f *z(i).*
59. Write the transfer function of an electrical low pass RC network.
60. Write the transfer function of an electrical low pass RL network.
61. Write the transfer function of an electrical low pass RLC network.
62. State Convolution Theorem.
63. Differentiate between transfer function and driving point function.
64. What are the limitations of Constant k-type filters?
65. Write the formula to calculate the gain of filters.

FIVE MARKS QUSTIONS:

1. A network has Z(s)= 1/s + 2/s+1 + 3/2s+1 .Derive a circuit with the given Z(s).
2. Which of the following polynomials are Hurwitz?

$$S^4+3S^3+4S^2+6$$
$$S^6+1$$
$$S^6+7S^4+14S^2+8$$

3. Design m—*derived* low pass filter, having a *cut* off frequency of KHz *and* design impedance of 600ohms.The frequency of infinite attenuation is 1.25/c.
4. State and prove Norton's theorem.
5. Design a Prototype Band pass filter (T-type) to match with a load of 600Ω and to allow frequencies between 3kHz and 6kHz.
6. Design a constant K low pass T-section filter to be terminated in 600ohms having cutoff frequency of 3KHz.Determine:
   A: attenuation at 6KHz. B: the character impedance at 2KHz.
7. Design an attenuator to operate on a characteristic resistance of 500 ohms to provide an attenuation of 15dB.

8. A sine wave has a frequency of 50KHz.How many cycles does it complete in 20ms?
9. A sine wave has a peak value of 25 V.Determine the rms, peak to peak, average values.
10. Realize the driving point impedance as Foster's first and second forms from

$$Z(s)=(S^2+1)/(S^2+4)$$

11. Derive expression for attenuation, propagation constant and characteristic impedance for p type filter.
12. Derive the relation for resonant frequency for series RLC circuit.
13. A series RLC circuit has R=5ohms,C=20uF and a variable inductance with applied voltage of having 1000 rad/sec frequency. Calculate the value of L when the voltage across the resistance is maximum.
17. 14. Draw the circuit diagram of a series RLC circuit fed by a voltage V=VmCosw t and obtain expressions for current, voltage and phase difference between the two.
18. Draw the equivalent circuit of an iron cored transformer fed by a voltage source. Write down the KVL equations and draw the final circuit of the coupled system.
19. Give a comparison between logarithmic and Laplace transformation. Show how inverse Laplace transform converts frequency domain function F(s) to time domain function f(t).
20. Obtain Laplace transform of: sin2t & cos 5t.
21. Show how source transformation from voltage to current source and vice versa can be effected.
22. Spilt a series RLC circuit energized by an a.c. circuit into 3 loops and write the loop equations.
23. An RC parallel network is energized by an excitation due to a current source. Determine the output voltage response across C.
24. Determine Laplace transform of a Sawtooth waveform of period T using the Gate theorem with an example.
25. Derive expression for attenuation, propagation constant and the character impedance for p type filter.
26. Draw the circuit diagram of a two port network using ^-parameters and derive its condition of symmetry.
27. The voltage applied to the series RLC circuit is 5 V. The q factor of the coil is 25 and the value of the capacitor is 200PF.The resonant frequency of the circuit is 200KHz.Find the value of inductance, the circuit current and the voltage across the capacitor.
28. A series circuit consist of two pure elements has the following current and voltage.
    v=100sin(2000/+50°)V>r-20cos(2000i+20°)A. Find the elements in the circuit
29. State and prove the reciprocity theorem with an example.
30. In a certain RC circuit, the true power is 300W and the reactive power is 1000W. What is the apparent power?
31. A voltage v(t)=l0 sinw t is applied to a series RLC circuit. At the resonant frequency of the circuit, the maximum voltage across the capacitor is found to be 400rad/sec and the impedance at resonance is l00ohms Find the resonant frequency. Also find the values of L and C of the circuit.
32. A balance star-connected load of (4-ij3)ohms per phase is connected to a balanced 3-phase 400V supply. The phase current is 12A.Find the total active power and the total apparent power.
33. A series RLC circuit consists of a 50ohms resistance, 0.2H inductance, and 10uF capacitor with an applied voltage *of* 20V.Determine the resonant frequency. Find the Q factor of the circuit. Compute the lower and upper frequency limits and also find the band width of the circuit
34. A series RLC circuit has a quality factor of 10 at 200rad/see.The current /lowing through the circuit at resonance is 0.5A and the supply voltage is lOV.The total impedance of the circuit

is 400ohms.Find the circuit constants.

35. A RLC series circuit is to be chosen to produce a magnification of 10 at 1 OOrad/sec. The source can supply *a* maximum current of 10A and the supply voltage is 100V.The power frequency impedance of circuit should not be more than 14. Mohms.Fiiid die values of RJL&C.
36. A current source is applied to the parallel arrangement of RLC where R*l 2ohms,L=2H and C-3uF.Compute the resonant frequency in rad/sec.Fmd the quality factor. Calculate the value of bandwidth. Compute the lower and upper frequency of tlie bandwidth. Compute the voltage appearing across the parallel element when the input signal is i(t)=l Osin w tl 800t.
37. A balanced star-connected load having an impedance (15+j20)ohms.per phase is. connected to a three-phase 440V,50Hz supply. Find the line currents and the power absorbed by the load. Assume RYB phase sequence.
38. A three-phase balanced delta connected load of (4+j8)ohms,is connected across a 400V, 3-phase balanced supply. Determine the phase currents and line currents. Assume the phase sequence to be RYB.Also calculate the power drawn by the load.
39. The two wattmeter method is used to measure power in three-phase load. The , wattmeter readings are 400W and 35V.Calculate the total active power, power factor & the reactive power.
40. Using Laplace transform obtain an expression for circuit energized by a dc voltage V. Draw the i(t) vs t graph.
41. Assuming that the prior to closing of switch k (at t=0) there was no voltage across capacitor nor current in inductor, find L 1(0+),(L:)(0+).

TEN MARKS OUSTIONS:

1. An admittance function is given by

$$Y(s) = (s+4)(s+6)/(s+3)(s+5)$$

Find the R-L network Foster form of realization.

2. Design an M-derived low pass filter (T and p-section) to match a line having characteristic impedance of 500ohms and to pass signals upto IKHz with infinite attenuation occurring at 1.2KHz.
3. Design a low pass composite filter to operate with a design impedance of 500ohms,w=0.2 and cut-otf frequency=2000Hz.
4. Give design of w-derived band elimination filter. Derive necessary expressions.
5. What are network functions? What are properties of realizable network functions?
6. Write short notes on:
   A: Laplace Transform of shifted functions.
   B: Superposition theorem.
7. Synthesize the following impedance function in Foster-1 and Cauer forms

$$Z(s) = \frac{(s^2+4)(s^2+25)}{s\,(s^2+9)}$$

8. Explain with examples the following:
   Network graph, tree of graph and cut set and show that the number of links for a graph having *n* nodes and *b* branches is *b-nt* 1.
9. What is a composite filter? Design a composite high pass filter to operate into a load of 600ohms and have a cut-off frequency of 1.2KHz.The filter is to have one constant K-section, one w-derived section with 1 KHz and suitable terminating half sections.
10. Synthesize the LC driving point impedance function

$$Z(s) = (s^4+10s^2+9)/(s^3+4s)$$

to get the Cauer First form and draw the network.

11. Give the difference between the Transmission and Inverse Transmission Parameters for reciprocity and symmetry.

12-JJraw the T and p-sections of a conventional filter using impedance Zi and Z:.Show that they can be made equivalent to two L or two T sections Finally obtain the input impedance of a p-section filter.

13. Write the short notes on any two of the following:
A: Convolution theorem B: Constant K-filters C: Impulse Response

14. What are 'polar plots' and what its advantages are? Obtain the polar plot of a semisoidal network function G(jw) and G(jw) m the X-Y plane for a series RC circuit energized by voltage source Vi(s),the output V2(s) being taken across C.

15. Write short notes on any two of the following:
A: Superposition &Mil.lman's Theorems.B: Transient and steady response.C: Pass and stop bands.

16. An unbalanced four wire, star connected load has a balanced voltage of 400V,the loads areZi=(4+j8)ohms; Z2=(3+?4)ohms; Z3=(15+j20)ohms. Calculate the line current in the neutral *and* the total power.

17. Design a m-derived (T & Π-type) HPF having cut off frequency, f_c = 5KHz, design impedance R_o= 600 ohms and m=0.35. Also determine the infinite attenuation frequency.